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George F. Kirkman

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PHILOSOPHICAL OBSERVATIONS ON THE ANALOGY BETWEEN THE PROPAGATION OF ANIMALS AND THAT OF VEGETABLES:

In which are anſwered
Some Objections againſt the Indiviſibility of the Soul, which have been inadvertently drawn from the late curious and uſeful Experiments upon the Polypus and other Animals.

WITH
An Explanation of the Manner in which each Piece of a divided Polypus becomes another perfect Animal of the ſame Species.

By *JAMES PARSONS*, M. D.
Member of the College of Phyſicians, Fellow (and Aſſiſtant-Secretary for foreign Correſpondence) of the Royal-Society, and of the Society of Antiquaries, in *London*.

LONDON:
Printed for C. Davis, Printer to the Royal Society, oppoſite *Gray's-Inn-Gate*, *Holborn*. 1752

TO

The RIGHT REVEREND

THOMAS,

Lord BISHOP of *LONDON,*

DEAN of the CHAPEL,

And one of His MAJESTY's Moſt
Honourable Privy-Council.

My LORD,

HOW ſtrange ſoever it may ſeem to the World, that a Phyſician addreſſes your Lordſhip to countenance a Work, drawn from the moſt diligent Reſearch into the Handy-works of GOD, I have ventured to rely upon a favourable Reception of it at your Hands, and to hope for your Acceptance of its Dedication; ſince its Tendency can amount to no leſs than the Promotion of his Glory, and the Encouragement of Morality and Virtue.

With Men of your Lordſhip's Way of thinking about ſuch Matters, as I cannot but imagine highly intereſting in our depraved Times, an Intention of this Kind will not fail of obtaining, at leaſt, a favourable Opinion; and as the Plan of Arguments, contain'd in the Work, is clearly drawn from ſuch Facts as no one in his Senſes can deny; I humbly hope their Conſequences cannot fail of appearing equally concluſive againſt the moſt hardened Atheiſt, in Proof of thoſe great Truths, which but too many of them had much rather did not exiſt.

True Metaphyſics are unqueſtionably of the greateſt Uſe and Importance in explaining the Attributes of the INFINITE CREATOR, and his Superintendency over all Things; yet, your Lordſhip cannot be unacquainted how little theſe refin'd Reaſonings are adapted to fix the Levity, and convince the Ignorance, of our modern Sceptics: Many of whom are preſumptuous enough to demand even a Divine Interview for their Conviction, while they are ſcarce intitled to the common providential Care of that BEING, whoſe

Wiſdom and Goodneſs they obſtinately continue inſenſible of.

For this Reaſon I was induced to try how far the Works of Nature might be apply'd, not only to ſupport the great Principles of Natural Religion, but likewiſe to add ſome Force to that of Revelation; by ſhewing as miraculous Effects in its common Courſe, as any of thoſe which have been formerly produced by the ſupernatural Power, occaſionally diſplay'd, for the Benefit and Inſtruction of Mankind.

I therefore determin'd laying hold on, and placing in a proper Light, a Subject, which, in the ſeveral learned Ages paſt, has been treated with no leſs Uncertainty than dangerous Impiety;

for not only many Ancient, but ſome Modern, Philoſophers have confounded Cauſes with their Effects, as they lately have ſome of the very Works of Nature with its Divine Author; and thereby moſt ſhamefully neglected to aſcribe its Creation and Eſtabliſhment to the OMNIPOTENT GOD, to whom alone they were due.

A true Explanation, then, of the Propagation of Animals and Vegetables will bid faireſt towards deſtroying the falſe Notions of the *Atomiſts*, in all their Branches and Syſtems; it will bid faireſt towards expoſing the Abſurdities ariſing from the many Fancies in the Coſmogony of the Ancients, as to the Eternity and ſpontaneous Modification of Matter; it will plainly ſhew, that the Forms and Order of Things propagated muſt be confeſſed to imply a wiſe CREATOR and Ordainer of them all; and that it was, for Want of of due Application to the Study of Nature, the Attributes of the DIVINE BEING were ſtill unknown to them. So it will alſo appear in the Progreſs of this Work, how vain, and even pernicious, Speculations contrary to Facts ever were.

I have already read this Treatiſe, by a Chapter at a Time, to ſeveral of your Lordſhip's Clergy, as well as to other Philoſophers; and it is from their Approbations I have been encouraged to take this Liberty; well knowing how neceſſary it is, that a

Work of this Kind ſhould be ſupported by a Patron of ſuch Eminence and Weight, among the Learn'd. And, altho' I have not the Honour of being known to your Lordſhip, I have the great Happineſs, among many others, of being edified and inſtructed by your Writings in the glorious Defence of our excellent Religion.---

And am, with great Humility,

Your LORDSHIP'S

moſt dutiful,

moſt obedient,

and moſt humble Servant,

JAMES PARSONS.

ADVERTISEMENT.

IN the following Sheets I hope it will appear, that my utmoſt Endeavours are not wanting, not only to make the niceſt Enquiries and Scrutinies into the Nature of the ſeveral Objects which are the conſtituent Matter of this Eſſay, but alſo to bring my Thoughts into as ſmall a Compaſs as might be well expected.

It may ſeem to ſome that this little Work is not free from Repetitions in many Places; but when ſuch as may be accounted ſo, are duly conſidered, they will appear neceſſary for the proper Illuſtration of the ſeveral Subjects, in preſerving their natural Connexions and Relations with each other, from the Beginning to the very Concluſion; and, as to Diction, I confeſs, my Care has been employ'd rather in ſettling a plain Account of Philoſophical Facts, and conſidering their natural Conſequences, than in the Choice of elegant Language, which could neither imbelliſh a Subject of this Nature, nor explain it half ſo well; Clearneſs, alone was my *my Purſuit here, in chuſing a Stile the beſt adapted to it, that I was able to produce.*

The general Purpoſe of this Undertaking was to confute thoſe vulgar Errors that have any Relation to the ſeveral Phænomena that belong to the Propagation of Animals and Vegetables; and by that Means to ſettle ſome other miſtaken Notions in Matters, which ſeem to me more intereſting, than the bare Conſideration and Deſcription of Philoſophical Objects in themſelves; however, tho' the Chain of my Plan is linked together in as natural a Succeſſion of Parts as to be void of any Digreſſion, yet there is ſome Variety in the Subjects of Natural Hiſtory which I have endeavoured, in the Progreſs, to ſet in a truer Light than they have hitherto appeared in.

Many of thoſe Truths that have been overlook'd by every Author upon the ſame Subjects, are probably now unveil'd, and are ſo abſolutely clear to myſelf, that I am neither afraid to exhibit them, nor aſhamed to draw thoſe Concluſions from them, which I believe a Heart eager for Knowledge, and an unprejudiced Eye, would diſcern to be their very natural Conſequences. If I err in any Reſpect, *it is inadvertently; nor will it be imputed to me as a Crime by the candid Part of the World; ſlight Errors will be look'd over, thro' which, if an honeſt Intention can maintain its Ground in the Opinions of the Public, the reſt will not be able to diſgrace it.*

The whole Work is plain Matter of Fact, blended in its Suggeſtions with the Flowers and Fruits of the Field and Garden, which every curious Perſon would be eager to inſpect for his own Satisfaction. Nothing is referred to, that can poſſibly offend the Ear or Eye of the moſt Reſerv'd; no unſeemly Subject made Uſe of to illuſtrate, but the moſt pleaſing and entertaining Objects are the ſtrong Evidences to aſcertain, the Syſtem I have undertaken to ſupport. It is therefore I call upon the Men of Leiſure to take a View of this Treatiſe, and of the Objects themſelves that illuſtrate it, which are in the Power of every one to procure, while the genial Sun, with his warm enlivening Rays, invites the ſweet Flowers to unfold themſelves, and wanton in the ſoothing Blaze. He will find himſelf ſurpriſingly gratified in ſuch Purſuits, and, perhaps, in tracing over the ſame Obſervations, be able to hit upon ſome-

CHAP. V.

Of the ſecondary *and* ſubordinate *Organizations of different Animals; of the* Polypus *and other Animals multiply'd by being cut in Pieces; of the* Indiviſibility *and* Immortality *of the* animating Principle; *and of Man's peculiar Advantages beyond thoſe of other Animals.*

CHAP. VI.

Conſiderations on the further great Happineſs of Man, in his Title to a Future State; *and of the* Conditions *of that Happineſs; wherein the true* Source *of the* Moral Law *is attempted to be explained.*

FIG. I. repreſents a Polypus with its Fœtuſes growing out of its Sides.

a The Parent Polypus.

b Two perfect Polypi ready to drop off.

c A younger one, out of a Fœtus.

d Two ſwelled Organizations growing out into new Polypi.

FIG. II. ſhews Part of a Tree with its Ramifications, which are its Fœtuſes.

a The main Trunk, or Parent.

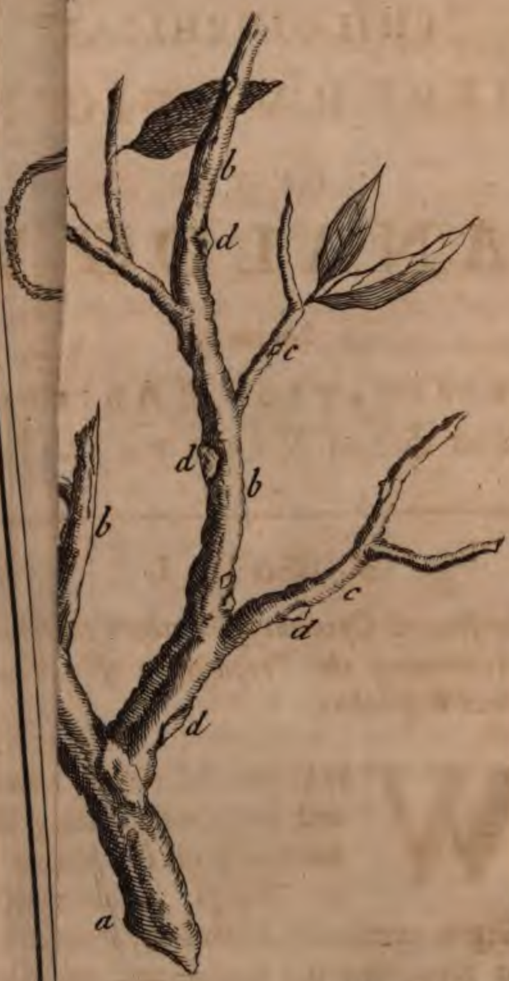
b Perfect Ramifications, or Fœtuſes.

c Others, out of theſe Ramifications.

d Swelled Organizations, growing out into new Ramifications.

PHILO-

II.



J. Mynde ſc.

PHILOSOPHICAL OBSERVATIONS ON THE ANALOGY Between the PROPAGATION of ANIMALS and that of VEGETABLES.

CHAP. I.

The ſeveral Opinions of Authors conſidered, concerning the Propagation of Animals and Vegetables.

WHO can ſufficiently admire and praiſe the amazing Benevolence of the Maker of all Things, in his vouchſafing to contrive a Means for continuing and ſupporting the animal and vegetable

Parts of the Creation in a ſucceſſive Series, by a Method of * Propagation, ſimple in itſelf, and obvious enough to be underſtood by every Obſerver, who can ſhake off

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* Here I omit the Word *Generation* in treating of this Subject, becauſe it implies, according to what I conceive of its true Meaning, the giving Being to Animals and Vegetables, or their firſt Creation. Γενεσις, ſays *Speuſippus*, *eſt motus ad eſſentiam*; *acceptio eſſentiæ*; *proceſſus in eſſe*; and therefore, ſince I would diſtinguiſh the γενεσις as the Work of the Omnipotent alone, at his firſt Almighty *Fiat*, I ſhall hereafter conſider the Word *Propagation*, as the more proper Term, and hope the Reader will find ſufficient Reaſon for it in the Sequel of this Work. For it will appear that after Being was given to the Number of various Animals and Vegetables that ſeem'd ſufficient and neceſſary to the Omnipotent; or, in other Words, after he had created them; his Command was that they ſhould increaſe and multiply, not that there ſhould be any new Generation, or Creation; becauſe he was pleaſed to make them capable of multiplying, or, which is the ſame Thing, of being ſucceſſively propagated.

Prejudice, preſerve his Thoughts from perplexing Obſcurities, and avoid ſoaring into Spheres foreign to the Subject, which many have done, who, by running out of Nature in their Conjectures about it, have run out of Reaſon alſo.

The Deſign of this Work is to endeavour to explain the Myſtery of the Propagation of Animals and Vegetables from their firſt Creation; to remove the dark Veils that ſome of the Learned have thrown over it, in their ſeveral Attempts to explain it; and to expoſe ſome Abſurdities and Inconſiſtencies in their Opinions; whereby we hope our own Account of the Matter will appear the more rational, and the abſurd Notions of the Proceſs of Things from Chance, or of the Government of any ſecondary Agent over the Progreſs of Animals and Vegetables, will appear childiſh and vain, and the divine Ordination of GOD and his Superintendency over his Works become more and more conſpicuous.

The firſt Notion that a Perſon, unſkilled in the Knowledge of the Structure of Animals, would conceive upon conſidering the *Coitus* between a Male and Female, muſt be, that each contributes ſomething towards the Production of a *Proles*, becauſe it would appear neceſſary for the two Sexes to meet upon the Occaſion, and conſequently that it muſt be a ſpermatic Matter to be mingled together in the Womb of the Female. And accordingly we find the ancient Philoſophers in Poſſeſſion of this Opinion, and embelliſhing it as their ſeveral Fancies led them. Some believed that the intire Quantity of Matter of the Male (together with a ſuppoſed Quantity of ſeminal Matter in the Female) was commonly the due Portion neceſſary to form the Offſpring. That if any Part of it ſhould happen to be rejected by the Female, all Hopes of an Offſpring were fruſtrated; hence ſprung that ridiculous vulgar Error of throwing Water upon the back Parts of Mares, immediately after they are covered by the Horſes, in order, as the Grooms ſay, to make them hold what they receive. Other Authors imagined that the ſeminal Matter of the Male alone produced the *Proles*, and that the Power of giving it a proper Form was in the *Uterus*.

This,

This, however, did not agree with ſome who thought the *vis Formatrix* could not be in the *Uterus*; that conſidering it only as a containing Part, and the ſpermatic Matter as a ſluggiſh Fluid, which (tho' a Matter proper enough to mould out an Animal from it) muſt lie unform'd without ſome *Opifex*, to give it Shape and promote its Progreſs; it was thought highly neceſſary to bring in a plaſtic Power, either inherent in the Matter itſelf, or always accompanying it, in order to guide and conduct its natural Advance, till brought to Perfection.

It will be to our Purpoſe to ſhew the Conjectures of the Learned concerning the *vis Plaſtica*, and the Uſe they made of it to ſolve all their Difficulties in accounting for many of the *Phænomena* of Nature, in a few Examples, which were handed down from the Ancients, with ſeveral Variations, even to ſome of the moſt modern Philoſophers. Scarce any Anatomiſt of Note has fail'd to write particularly upon the Subject, and not one of them has omitted to quote the Opinions of every Philoſopher from *Hippocrates* down to himſelf, as Authorities for his own; one of which *(Caſpar Bauhine)* will be ſufficient to afford us Examples of the general Notions held concerning the *vis Plaſtica.*

In the ninth Chapter of his firſt Book *, where he accounts for ſome of the Cauſes of monſtrous Births, he adheres to the Opinions of Authors before him. He ſpeaks of it as a Being diſtinct from the *Semen*, and altho' it cannot be ſuppoſed that, when Matter was firſt created, the Divine *Being* would have committed the Diſpoſal and Guidance of Things to any impotent finite Agent, for their Forms and Motions, that might either voluntarily, or thro' Ignorance or Indolence, ſuffer Errors to creep into Nature's Works, whoſe Deſign for, and Care of his Creatures, was that all ſhould be good; yet what an indolent and ſottiſh Artiſt does he make this *vis Plaſtica*, in ſhewing the following Reaſon for the Diſſimilitude † of the Offspring ſometimes to the Parents: "For "altho', ſays he, the *forming Faculty*, ac-

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* *De Hermaphraditis.*

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† The following Abſtract of my Obſervations on the preternatural Conjunction of two Female Children from the *Tranſactions* of the Royal Society, N. 489, pag. 532, for *Nov.* 1748, will not be improper here, for they will ſerve to lay before the Reader what relates to the true Cauſe of Monſtroſity: "When ſome former Authors (before the Learned were ſo happy as to know the Sweets of experimental Philoſophy) endeavoured to account for the monſtrous Productions in the Animal World; they could have Recourſe to no other Means to explain them, than to the then reigning Syſtems, by which they uſually explain'd the *Phænomena* of the natural Generation of Animals; and that was in general, that an Animal was produced by the Admixtion of the ſuppoſed ſeminal Matter of both the Parents; that the Quantity, produced by this Admixtion, was ſuppoſed always to contain only a Quantity of Particles, ſufficient to produce a natural *Fœtus*, by the Mediation of a plaſtic Power ſaid always to attend

" companying the Seed, may have the
" Image of all the Parents Members; yet
" if ſhe is not equally excited by them
" all

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attend it, as well as every other natural Production in the World.

Upon this Plan many little Alterations were made by ſucceeding Authors, without differing widely from this general Notion; all as liable to Objections, and as eaſily refuted, as the erroneous Source from which they ſprang. We ſhall here conſider how the Conjunction of theſe two Children happened, as well as the Means whereby Children and other Animals acquire ſuperfluous, or want the neceſſary Members, or are otherwiſe deformed. When the *vis Plaſtica* was thought to be the Agent for the Guidance of the Work of Propagation, and that a monſtrous Child appear'd, this *Power* was blamed by the Authors of moſt Nations in ſome of theſe Particulars: The ſeminal Matter was either in too ſmall or too great a Quantity, and the *vis Plaſtica* puzzled in the Management of the Particles that go to form the Parts of the Animal; or it was ſometimes careleſs and negligent in the Application of the Ideas of ſome or other of the Parts,

“ all to make ſuch another Piece of
“ Work, and not ſufficiently applied to
“ every Image in forming the *Fœtus*, the
“ Offspring

Parts, and conſequently the Animal muſt want ſome Limb or other; or, from a Superabundance of Matter, have ſuperfluous Limbs added to them by this unſkilful erring Agent.

We have, in the Courſe of this Work, proved that each *Seed* and *Ovum* contains the Animal and Vegetable proper to its Species. Now, when two or more of theſe Animal *Ova* are fœcundated and come into the *Uterus*, the Sides of the *Ova* (which are the Membranes that contain the Fluids, in which the little Organizations ſwim) muſt inevitably come into Contact; and, if the Membranes of each continue in a good State, the *Fœtuſes* will be free, in their ſeveral Apartments, and grow ſeparately in due Proportion; but if the Parts of the Membranes which are cloſe together, by being thin and weak, or by any irregular Reſiſtance or Friction, come to be diſſolved or broken, then the Fluids of both unite, and the two little Organizations, having no longer a Partition between them, come together, adhere, and intwine into each other,
their

"Offspring will not be like the Parent."
Thus is the *plaſtic Power* accuſed of Careleſſneſs or Want of proper Application to the
Buſineſs

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their Parts eaſily coaleſcing; and from the natural Diſpoſition of each to grow and increaſe their Accretion goes on; there is a mutual Inſinuation of Veſſels where the Parts are compreſſed, and a mutual confuſed Circulation carried on, and at length the Whole becomes irregular and monſtrous.

We have many Facts to corroborate this Opinion, and to ſhew that the Fibres of Animals and Vegetables have a wonderful Capacity of extending and inſinuating themſelves into one another; and of continuing a Circulation reciprocally, and the Blood-Veſſels of being elongated where the Reſtoration of a Part requires it. Elſe how ſhould wenny Tumours of a monſtrous Size be produced on the Surfaces of Animal Bodies? How ſhould the Lungs adhere to the *Pleura* ſo intimately as to become one intirely united Maſs, as incapable of being ſeparated without a Knife as any Part of a Muſcle? How ſhould the Buds of Trees, implanted into others by Grafting or Inoculation, ſo inſinuate their Fibres into thoſe of the Stock in which they
grow,

Buſineſs in Hand; as if the Author had ſaid, ſhe can form a *Fœtus* perfectly like the Parent, when ſhe gives her Mind to it; but,

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grow, as to become one continued Piece of Wood with them? How are the Sutures of the *Scull*, and thoſe of the Epiphyſes of Bones, totally obliterated in an advanced Age, but by the Inſinuation and reciprocal Combination of the Fibres of each other? And, in a Word, how are many recent deep Wounds ſo ſoon agglutinated, if there be not a ſpeedy Inſinuation of Veſſels, and a Circulation ſoon carried on?

Indeed, if we are only to look and conſider theſe two Children in their preſent State, it will be ſomewhat difficult to conceive how this ſtrange Conjunction ſhould happen; but we are to go back, and conſider them, when they were two minute ſeparate Organizations, whoſe remoteſt Parts from each other might not exceed perhaps the fiftieth Part of an Inch, at the Time of their Adheſion, and the Difficulty is taken away. Thus, our Children happening to be compreſſed by their Bellies, the tender Integuments between the *Muſculi recti* in each were ſoon thinned and diſſolved; the Coalition happen'd, as I ſaid before, and the Intruſion and Commixtion of but, if at any Time ſhe happens not to think of every Part of the Parents in forming their Child, ſuch Parts as are

forgotten

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of Parts that appeared before the Society, which the ſeveral Figures in this *Tranſaction* ſhew, was begun and carried on by their growing whereſoever the Reſiſtance was leaſt.

And thus, if the Contact and Preſſure of the two *Fœtuſes* be pretty equal and moderate, they will grow equally; if the Compreſſion be very great, and both be preſſed all round, having no Room, becauſe of the *Uterus* not giving way, the Confuſion of both, or indeed of one only, will be ſo great as to cauſe them to become a Maſs without any Form or Regularity at all: If their Contact be ſo diſpoſed as that one *Fœtus* is much compreſſed and confined, and the other has ſufficient Room; this will grow proportionably, whilſt the Growth of the other being intirely ſtopped from the Beginning in its minute State, except perhaps an *Arm*, *Leg*, or *Head*, &c. that *Fœtus* which has Liberty will have ſuch ſuperfluous Limb, or Part, growing with it, as remain'd uncompreſſed, while the other is obliterated and loſt.

The

forgotten may be left out, and the Child may therefore become imperfect.

This,

The ſame is alſo apparent in Vegetables; a Carrot, Parſnip, Radiſh, and ſuch like, as naturally grow ſtraight and well formed, may be diſtorted and altered at Pleaſure, as they grow, by Compreſſion; for, as the nutritious Juices are equally diſtributed, and attracted in the ſame Quantity into the Plant, for the Uſe of the Whole; if a Compreſſion he made on any Part, thoſe Juices which are hindered to flow into ſuch compreſſed Part, will be determined elſewhere, and make Gibboſities and Deformities in other Parts of the Organization where the Reſiſtance is leſs, and the Whole become changed from its natural Form. Thus *Gourds*, as they grow, in applying Preſſure by Ligatures or otherwiſe, may be brought to various Shapes; and Apples, Pears, *&c.* placed in cylindrical *Phials*, whilſt they are ſmall, will by the lateral Preſſure loſe their roundiſh Form, and acquire that of a Cylinder. And thus Nuts, Apples, *&c.* may be conjoin'd and become double while young and minute, and not becauſe there was any ſuppoſed Superfluity of Matter to form them by any ſubordinate Help; and thus a Nut, Apple, *&c.* among a Bunch of

found

This, however, is not the only Fault laid to her Charge, for in the very next Sentence ſhe is ſaid to be ſomething ſo unſkilful, as to place one Limb where another ſhould be, by being (ſays the Author) *inordinately diſtributed through the Semen.* And again, ſhe is diſgraced by being counted incapable of regulating

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found ones, may, by Compreſſion of its Organization, be vitiated and ill-form'd, but not becauſe there wanted a Sufficiency of this ſuppoſed Matter.

In this Manner all Animal and Vegetable Monſtroſities happen; and this was the Caſe of the Cow which many of us ſaw; her twin Siſter happen'd to be confined and compreſſed to her Spine; nothing remaining free but the *Abdomen*, the *Dugs*, one of the anterior Extremities, and the Dewlap; every other Part was obliterated, whilſt theſe continued to grow, by the Communication of Veſſels between them in the Manner above explained; as well as of the Ox now ſhewn here, from whoſe Neck the ill-form'd Head of a Twin hangs down, every other Part being deſtroy'd but this.

the Matter either of the Blood or *Semen* at ſome Times, which the Author ſuppoſes to be chief Cauſe of Monſtroſity; for, in both theſe Caſes, there is not the leaſt Suppoſition of a Deficiency of Matter to work upon, notwithſtanding the Errors aſcribed to this *vis Architectonica*. But a little after he ſeems to make ſome Apology for this Power, where he ſays, "the Matter itſelf may hinder the *vis* "*Formatrix*." If there be either too little or too much, or if it be unequal in its Subſtance from a Fault in its Effuſion, Denſity, Hardneſs, or from the Corruption of the maternal Blood or *Semen*; and the great *Galen* himſelf thinks the Cauſe of Monſtroſity may be aſcribed to the Weakneſs of this forming Faculty; and therefore our Author the more boldly affirms, that ſhe may well be confuſed, and make very great Miſtakes from theſe Defaults. At length, in order to account for the Production of very large Bodies, he ſays, that even Giants may proceed from an Abundance of *Semen*, upon Condition that the *facultas Formatrix* is able to govern the Whole in its Formation.

The famous *More* * accounts for all the Phænomena of Nature by the Help of this ſame plaſtic Power; he has given it ſeveral Appellations: In one Place it is ſaid to be the *Soul of the World*; in another the *Spirit of Nature*; and again, the *Quartermaſter-general* of Divine Providence. He makes this Spirit of Nature ſerve him to ſolve all Doubts and Difficulties in the moſt occult and abſtruſe Parts of Philoſophy; by this he, as well as others, accounts for ſympathetic Cures, which he firmly believes in; for Sympathy between earthly and aſtral Bodies; monſtrous Births; Attraction of the Loadſtone; the Formation of Animals and Vegetables and many other Things interſperſed thro' the whole Work.

To what ridiculous Lengths do Men run, when furniſh'd with ſo convenient an Inſtrument as this *Soul of the World*, to gratify and help them out of all their

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* *Henry More*, Fellow of *Chriſt's College* in *Cambridge*; he wrote a Treatiſe, intitled *The Immortality of the Soul*, printed at *London* in 1659.

Difficulties? What a happy Invention; how lucky a Thought; and yet how deſtitute of any Poſſibility of being made manifeſt to our Underſtanding; with which the ſurer Teſtimony and Aſſiſtance of experimental Philoſophy would beſt agree, as well as with the Nature of Things in general, provided a proper Uſe be made of them!

It is but reaſonable to expect that the Faults and Defects of Favourites ſhould be apologized for and ſkreened by their Patrons: And thus it is in the Caſe before us. Our Author *More*, in order to give Weight to this beloved Syſtem, gives us a Definition of his *Spirit of Nature*, but is not aware of the Abſurdities that ariſe from it. And, at the ſame Time, neither he, nor any of his Predeceſſors, from whom he borrowed it, were able to give the leaſt Account of any Subject of this Nature without it. His Definition will ſhew the Senſe of all the other Authors that have uſed it, and therefore I am the more encouraged to ſet it down in this Place, to ſhew how frail a Foundation they all built upon, as well as any others, who ſhall at any Time raſhly aſcribe to a ſuppoſed, weak, erroneous Being, thoſe glorious Operarations of Nature, which can be the Work of no other than an omnipotent unerring GOD. His Definition runs thus: "The Spirit of Nature is a Subſtance incorporeal, but without Senſe "and Animadverſion, pervading the whole "Matter of the Univerſe, and exerciſing "a plaſtic Power therein, according to "the ſundry Prediſpoſitions and Occaſions in the Parts it works upon; raiſing "ſuch Phænomena in the World by "directing the Parts of Matter and their "Motion, as cannot be reſolved into "meer mechanical Powers".

To be a Subſtance incorporeal is to be ſomething diſtinct from the Matter it pervades, and conſequently can have no Part in the Mechaniſm or Subſtance of Matter; but, if it has not any Part in the Subſtance of Matter, then it muſt be only the Director of the Formation of Matter. Now to be the Director or Orderer of any Thing neceſſarily implies a Knowledge beforehand of what's to be directed, and it is utterly impoſſible to be otherwiſe. But he ſeems to make uſe of ſome Precaution, tho' very little to his Purpoſe, in the very next Sentence, where he ſays, that this Subſtance is without *Senſe* and *Animadverſion*; for he well knew, if he had allow'd this Subſtance incorporeal Senſe and Animadverſion, ſufficient to regulate all the ſtupendous Orders and Motions of the univerſal Creation, it would be very near granting the Exiſtence of another Being of infinite Power, which would amount to a moſt blaſphemous Doctrine, much worſe than allowing the Exiſtence of a Soul to inanimate Matter: But, in order to avoid Splitting upon this Rock, he denies both theſe Qualifications to his Agent, and thereby falls into the greateſt Abſurdities; for, if there be neither Senſe nor Animadverſion in this Spirit of Nature, with what Probability can any Power whatſoever be aſcribed to it?

Among the Variety of Authors that thought this *plaſtic Power* of great Uſe to them, ſome allow'd it to all the Parts of Matter in general; others confined it to flexile Matter alone, as being in their

Opinions moſt capable of yielding to the Force of that Power, and this comprehended what belong'd only to Animals and Vegetables. Now this Power muſt either be intrinſecally in the Matter itſelf, or ſomething ſeparate from the Matter, yet always attending the natural Alterations and Formation of Bodies. Many have placed it in the Matter itſelf, and it is to be fear'd this Notion is at preſent too much indulged among ſome Philoſophers of our own Time.

If Matter be ſaid to have this Power in itſelf, then it muſt be ſuppoſed its own *Formatrix*, to modify itſelf into all the Forms that appear to our Senſes in every Animal and Vegetable Being whatſoever. But let us conſider, that, if there was a Time when Matter, or any Part of it, was unform'd, it muſt be ſuppoſed to have been inactive and at at Reſt at that Time; and if it be ſaid that this Matter became active at any Time to form itſelf, independent of a Supreme Being, then it muſt be ſuppoſed to have had a Preſcience of whatſoever different Orders, Situations, Forms, Motions, and Qualities there was a Neceſſity for, ſerving to the correſponding Well-being of the Whole: For ſuch a Power neceſſarily implies a previous Deſign to form and diſpoſe itſelf into every Species of Being that poſſibly can be. And then, if this Preſcience is allow'd to Matter, it muſt be allow'd alſo to have been eternal, becauſe an *Exordium* to Preſcience cannot be accounted for *. Thus, in once ſuppoſing a Falſhood, Authors, are compell'd afterwards to become ridiculouſly abſurd in the End. In ſhort, we might thus fooliſhly uſurp other Attributes, and beſtow them on Matter, which (upon viewing the moſt mean Part of the Creation) common Senſe muſt confeſs to belong to an infinite all-powerful *Being* alone, who created Matter, and annexed to it ſuch conſtant Laws as always preſerve it in thoſe Forms, Motions, *&c.* which have till now ſubſiſted in the World. What Labyrinths of dangerous Errors would ſuch wild Fancies lead Men into?

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* When *Materialiſts* are driven thus far, they are in a Labyrinth, from which they cannot extricate themſelves, without acknowledging Preſcience to precede the Formation and Order of material Things at leaſt, even if they ſuppoſe the Matter itſelf to be coeternal with that Preſcience; if this cannot be denied, I would aſk what is Preſcience? Surely it muſt be anſwered, that it is an *Attribute* only of ſome Being. Of what Being? Of Matter, or of an omnipotent intelligent Being? Who in his Senſes can refuſe the latter? And who ſo fooliſh as to imagine Matter could have Exiſtence at all without the previous Cogitation of that all-wiſe all-powerful God?

Again, would not Matter ſuffer ſome Diſgrace, if it could form itſelf, and at the ſame Time not be able to prevent the Decay and Putrefaction which we ſee every Creature under the Sun is ſubject to in its Turn? For what was once neceſſary in her previous Intentions ought, one would naturally think, to be always ſo. But there are manifeſt Alterations and Changes in all Bodies, even from the Beginning of every Thing, in the Animal and Vegetable Parts of the World, up to its State of Perfection, and thence downwards to its temporal

Decay and Deſtruction, that their regular Succeſſion ſhould be fulfilled and carried on, according to the Plan which we are Witneſſes to every Day.

But if the *plaſtic Power* is ſomething diſtinct from Matter, then, in order to be duly qualified for its Buſineſs, it ought to be omnipreſent; otherwiſe it could never take Cognizance of all the Caſes that require its Aſſiſtance, or give everywhere conſtant Attendance to Nature, ſo as to lend a Hand to the Motion of Planetary Bodies, the Growth and Formation of Animals and Vegetables, the Diſpoſitions and Combinations of Things whereſoever they are all over the Face of Nature. But is this or any other Attribute to be aſcribed to a ſuppoſed Agent, ſo incapable of performing what Philoſophers have granted, as to ſuffer Errors to creep into what it is about, or different *Luſus* of Nature into many Parts of the Animal and Vegetable Worlds, which various Accidents only in the Courſe of their Growth and Increaſe are the ſole Cauſes of; ſince, according to thoſe Authors, the chief Buſineſs of this

Power is to ſee all Things preſerved and propagated to the moſt perfect and beſt Advantage?

In viewing and conſidering all theſe Circumſtances, can we avoid counting them ſo many Falſhoods and Abſurdities ariſing from the Uſes they made of this *vis Plaſtica*? And do not the following Inferences naturally ariſe? It is abſurd and ridiculous to ſuppoſe the Regulation of the Forms and Modifications of rude Matter into every Thing that makes up the Syſtem of the World, ſhould be committed to a ſecondary, finite, ignorant Overſeer, none being equal to that Taſk but one of infinite Power. If this was the Caſe, how miſerable would the State of Nature be, ſince many Chances muſt happen againſt the Welfare of all Things in the Animal and Vegetable Worlds, from the Imperfection of their Conductor? The Matter wrought upon muſt not exceed, more or leſs, a certain Limit in Quantity or Quality; the *vis Plaſtica* muſt not forget, nor be careleſs over what ſhe is about, or Animals are liable to have their Heads where their Heels ſhould be; the Majority of the Inhabitants of the Earth and Waters would be monſtrous, Confuſion would occupy the Face of all Things, and the Divine Omnipotent would have produced an Effect contrary to the great Care and Goodneſs for the Propagation and Preſervation of his Creatures that ſhines through all his Works, in employing ſuch an Agent to perform what his own bare almighty Thought could in an Inſtant bring to paſs.

Thus did Authors play with this *plaſtic Power* from Age to Age, until the learned Members of the *Lyncean* * Academy began to puſh their Enquiries into Nature's Works in *Italy* further on towards the Truth. They began to reject all Notions of ſpontaneous or equivocal Generation. They began to conſider the Appearances in the ſpermatic Subſtance of ſome Animals they had examined as Eggs, from whence the future Animal was to come; and to find by their Obſervations many Things tending to this great Truth; recurring to ſome particular Paſſages of *Ariſtotle*, to which the Members of this Academy gave great Attention, and which ſome modern Philoſophers ſhould not have neglected, ſince the Aſſiſtances they have obtain'd from the advanced Progreſs of experimental Philoſophy, are greater and more advantageous than any that Academy could boaſt of. They could find *Ariſtotle* (early as he was in the World, and forming his Notions, as all the moſt ancient Philoſophers generally did from meer Conjecture) cloſely bordering upon the Doctrine of Eggs in the Syſtem of Animals.

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* It would be a criminal Omiſſion to loſe this Opportunity of giving ſome Account of that Academy, the Members of which perform'd ſuch great Things towards the Advancement of Learning, if we did not intend ſoon to publiſh a Hiſtory of its Foundation and Members; which cannot I imagine fail of being greatly acceptable to the truly learned World, at leaſt, to thoſe who are Lovers of Natural Hiſtory, and of Antiquities.

We find *Johannes Faber*, in his Comments upon *Hernandez* *, conſidering ſome Paſſages from *Pliny* †, wherein he aſſerts, that ſome Animals are produced without the Aſſiſtance of Parents like themſelves, as the *Salamander*, *Serpents*, *Oyſters*, or any others that ſtick to Rocks or Shoals, to which he denies any Difference of Sex, Eggs, &c. We find this ingenious *Faber*, I ſay, oppoſing to this Notion ſome Experiments of *Dalechampius* §, who ſays, that upon opening a *Salamander* he found above thirty *Fœtuſes* all in Motion and ſwimming in Water, and that above thirty Eggs appeared alſo. He adds, that he remembers to have ſeen ſome of theſe Females pregnant as well with Eggs as *Fœtuſes*, and of theſe that ſome were imperfect, and ſome very compleat, moving and ſwimming in Waters, and concludes from hence that what *Pliny* aſſerts concerning them is falſe.

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* Rerum Medicarum Novæ Hiſpaniæ Theſaurus, ſeu Plantarum, Animalium, Mineralium Mexicanorum Hiſtoria ex *Franciſci Hernandez* Novi Orbis Medici primarii Relationibus in ipſa *Mexicana* Urbe conſcriptis; *a Nardo Antonio Recchio*, &c. collecta, &c.

† Lib. X. cap. 68. Quædam vero gigunntur ex non genitis et ſine ulla ſimili origine; ex iis quædam nihil gignunt ut ſalamandra. Neque iis genus maſculinum fœmininumve, ſicut neque in anguillis omnibuſque quæ nec ovum nec animal ex ſeſe generant. Neutrum eſt et oſtreis genus, & cæteris adhærentibus vado vel ſaxo.

§ This good old Author in his Comment upon this very Paſſage of *Pliny* refutes him by theſe Obſervations.

* *Bellonius* favours *Faber* in the ſame Opinion, for he had made many curious Reſearches before the *Lyncean* Academy was formed, among whom the Microſcope appears to have been in great Perfection and in frequent Uſe. It is evident then, that the Members of this famous Academy held the Doctrine of

ſpontaneous Generation in the utmoſt Contempt; for we find this *Johannes Faber* (who was in the greateſt Credit and Eſteem with the reſt of the Members) arguing ſtrenuouſly againſt it, and at the ſame Time proving that *Ariſtotle* himſelf allow'd that the *Purpura* or *Murex* is produced from ſomething depoſited in the ſeminal *Favago* or glutinous Sperm ejected by them when they meet in the Spring, in great Numbers, for that Purpoſe. He ſtrengthens this Opinion by a Quotation from *Scaliger*, explaining this very Paſſage thus: "Eſt igitur quaſi modus coeundi "ſi conveniunt, ut quaſi a mare & fœmina "emittatur ſalivæ genus." And *Pliny* * too, notwithſtanding what he ſays in another Place, towards denying either a Difference of Sex, Eggs, and the like to the Animals mentioned before, yet explains *Ariſtotle's* Words of this very Paſſage, as follows: "Purpuræ congregantur verno tempore, mutuoque attritu "lentorem cujuſdam ceræ ſalivant." This Sentence favoured the Argument of the learned * *Faber*; he lays hold of the Occaſion, and with Reaſon enough ſays, he finds *Pliny* acknowledging the Coming or Rubbing together of the *Purpuræ*; for, ſays he, what is this kind of Congreſs but a certain Manner of performing the *Coitus*, and how could *Pliny* deny in another Place, that Oyſters, and all other teſtaceous kinds of Fiſh, ariſe from Putrefaction?

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* Altho' we do not find he was a *Lyncean*, yet that he had much the ſame Sentiments with the Members of that Academy concerning this Subject. He flouriſhed in 1564, which was a conſiderable Time before the *Lyncean* Academy, was founded and is quoted by *Johan. Faber*.

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* Lib. 9. cap. 37.

And when *Ariſtotle* ſays: " That the " *Purpuræ* are produced from that Hu-" mour, when ſhed upon the Ground, " conſiſting of a very minute Beginning, " and the *Fœtus* is form'd like a Species " of Berry;" *Auguſtinus Niphus* explains it thus, who was another of his Commentators, " Hic igitur ex ſalivatione " emiſſas tanquam ex ſeminario mucore " purpurulæ gignuntur. — Concludit de-" mum *Ariſtoteles* qua forma formetur " fœtus, purpurarum ſub initio, & vult

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* Vide Aliorum Novæ Hiſpaniæ Animalium *Nardi Antonii Recchii* Imagines & Nomina *Johannis Fabri* Lyncæi Bambergenſis, *&c.*— pag. 756, 757.

" illum formari ſimilitudinem racemi
" uvæ, ut etiam de Apum fœtificatione
" poeta dicit :

Confluere ut lentis uvam dimittere ramis.

" Unde dicit *Ariſtoteles :* Itaque
" per anguſtiam fœtus formatur ſpecie
" uvæ. Id eſt, ad ſimilitudinem uvæ,
" quando involvitur in ſeipſa propter loci
" ſtricturam. Hic igitur perſpicuum eſt
" fœturus teſtaceorum non fieri, niſi facta
" congerie priùs ex mucore illorum,
" tanquam ex ſeminario, & ad modum
" racemi uvæ, cum uva incipit fieri."
From all which it is evident beyond Contradiction, that *Ariſtotle* found little Bodies like Berries in this mucous Matter, and that the Whole was the Conſequence of a natural *Coitus* between Males and Females.

Now the Uſe that *Faber* makes of this, is to ſhew that what *Ariſtotle* calls Berries are nothing but Eggs, from whence and many other learned Arguments made by him to the ſame Purpoſe, it is eaſy to conclude, that the *Lyncean* Academy in general, by frequent microſcopical

Obſervations, had exploded every Notion of ſpontaneous or equivocal Generation from among them, and had enter'd ſtrongly upon that ſtandard Opinion, not long after confirm'd by our immortal *Harvey*, * *(Omnia ex Ovo)*. And this will appear yet more evident to any one who reads another Paſſage from the ſame Author; wherein he aſſerts that he does not doubt in the leaſt, whoever was to examine the above-mentioned *Favago* with the *Perſpicillum*, which, ſays he, I firſt call'd by the Name of *Microſcope*, but that he would find in it the manifeſt Eggs of theſe teſtaceous Animals. And indeed it is not much to be wondered at, that they ſhould have made many noble Diſcoveries in this Academy; when their Microſcopes were in ſuch Perfection as he deſcribes them to have been, whoſe Veracity and Impartiality are ſufficiently eminent through all his Works, and who affirms that minute Objects were magnified by them above thirty thouſand Times, as he had calculated it from Arithmetical and Geometrical Principles.

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* This wiſe Anatomiſt ſtudied at *Padua*, about the Time of the Inſtitution of the *Lyncean Academy*, whoſe Notions concerning the Propagation of Animals we can by no Means imagine he would have been heedleſs enough to neglect, no more than he would thoſe of *Hieronymus Fabritius ab Aquependente* upon the ſame Subject, who was his Profeſſor of Anatomy at that famous Univerſity, and who made many Obſervations upon the Formation of the *Fœtus*, and that of Eggs and Chickens. Theſe Tracts with his other Works were printed in 1623, Folio, at *Francfort*; and in 1625, Folio, at *Padua*. Our Author *Harvey* went to *Francfort*, and, in the Year 1628, publiſhed there his "Exercitatio Ana-" tomica de Motu Cordis & Sanguinis in Ani-" malibus." Which was but five Years after the Publication of *Fabritius*'s Works at that Place. But it is amazing to conſider his wonderful Conſtancy to this Subject, after his

He makes us thoroughly ſenſible that he was not the only one among the Mem-

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his Fatigues and Warfare with ſo many Opponents to his Doctrine of the Circulation, and his great Sagacity in finding Means of penetrating deeper into every Undertaking than any of his Predeceſſors.

bers of that Academy, who was well verſed in the Knowledge and Uſe of the Microſcope; and gives many Inſtances of the glorious Diſcoveries of ſeveral other Members of the ſame Society; among whom he does Prince * *Cæſius* and *Franciſcus Stellutus* much Honour. Of the former he declares that by the ſame Aſſiſtance he diſcover'd, and cauſed to be drawn, ſeveral Plants with their diſtinct Seeds, which hitherto had been thought to want them; and that the Duſt appearing upon the Leaves of *Polypodium* was by him magnified to the Size of Grains of Pepper, and which this glorious Prince had, long before he had any Notion of the Microſcope, conſider'd as the true Seeds of the Plant, and accordingly very juſtly call'd thoſe of this Claſs tergifœtous Plants. Theſe and numberleſs other ſuch Diſcoveries and Obſervations were the Effects of this Prince's Study, the Publication of which was impatiently expected by the Learned of his Time.

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* The Founder of the *Lyncean* Academy.

It was with this ſame Microſcope that this *Franciſcus Stellutus* † made his Obſervations upon the Parts of the *Bee*, which were

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† The Figures of this Print were diſpoſed as follows: On each Side, a Branch of a Tree with Leaves and Berries runs up to the Top of the Plate; in the upper Branches of which are two Boys, that on the Right holding a triple Crown on his Head, and that on the Left two Keys, one on his Shoulder, and the other flung behind by a Chain. Between the Boys is the following dedicatory Inſcription on a Scrol, *viz.*

VRBANO VIII. PONT. OPT. MAX.
Cum accuratior ΜΕΛΙΣΣΟΓΡΑΦΙΑ,
a LYNCEORUM ACADEMIA,
in PERPETVAE DEVOTIONIS,
Symbolum ipſi offerretur.

Beneath this Dedication are three microſcopical Views of a *Bee*; one a ſide View, one a View of the Belly, theſe are on a Line; and the under one a View of the Back. They are magnified to above four Inches in Length, and the Hairs, reticular Structure of the Eye, were engraved in an elegant Taſte on a Folio Copper-Plate, as they were magnified; a Print of which I now have in my Collection,

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Eye, and other minute Parts are finely expreſſed.

Under the lower Bee there is another Scrol which takes up the whole Breadth of the Plate, at the Bottom; whereon are engraved the following Verſes, with the Author's Name under them:

Magne Parens rerum cui ſe natura volentem
Subjicit, et dominos collocat ante pedes,
Reſpice natura, qua nil præſtantꝰ omni
E BARBERINAE ſtemmate Gentis APEM:
Hāc uti Lyncëidûm propriori lumine luſtrans,
Diſpoſuit tabulis, explicuitque labor.
Cæſiade Genio ſacrum ſtimulante laborem,
Palladis et promptos arte juvante viros.
Maxima dum tereti ſurgunt miracula vitro
Majoremq; oculus diſcit habere fidem.
Quis norat quinas Hybleo in corpore linguas,
Atque leoninæ proxima colla Jubæ.
Hyrſutoſq; oculos binaſq; labris vaginas
Ni facerent artis diu reperta novæ?
Sic decet, ut dum te mirādū ſuſpicit orbis,
Et mage mirādā ſe tua præſtet APIS.
Ponebat IVSTVS. RIQVIVS. LYNCEVS.
BELGA DEDIC. S. E.

The

lection, being, I believe, the firſt Microſcopical Engraving that ever was made.

Our Author *Faber* diſcourſes learnedly upon Eggs, was a nice Scrutator of *Ariſtotle* and *Hieronymus Fabritius* upon that Subject; and it appears by his own Words, Page 758, that himſelf, as well as Prince *Cæſius* and *Stellutus*, was a conſtant Obſerver of minute Bodies, being no leſs curious in having Drawings made of the Objects of his Obſervation. He ſays, he often found in his Garden the Eggs of Lizards in Pots of dry Earth, deſtitute

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The Sides and Bottom of this Scrol are adorned with the *Antennæ*, *Proboſcis*, Legs, *&c.* of the Bee, magnified to the ſame Proportion with the Bees above, and on one Side, under the Stem of the Branch, is engraved,

ROMÆ
Superior: permiſſ. 1625. } on the other { M. Greuter
delineav. incid.

and directly under the Scrol the Author's Name thus:

FRANCISCVS STELLVTVS LYNCEVS
FABR^{is} MICROSCOPIO obſervabat.

A farther Account of this Dedicatton will be given in my intended Hiſtory of the *Lyncæan* Academy.

of any Plants, and diſcovered in them the little Animals coming to Perfection, which he had alſo cauſed to be delineated. It was this Diſcovery that gave Occaſion to a long Diſcourſe of Eggs, and their Nature and Properties, which he purſues with great Learning and Accuracy; wherein he declares that himſelf had diſſected Hens in various Manners, in order to enable him to confute the Errors of ancient Philoſophers upon this Subject.

This was the State of the Opinions of that glorious and moſt learned Body concerning Generation, which they had ſtrongly eſtabliſhed, very ſoon after their Academy was founded; nor was *England* deſtitute of an Enquirer of as great Eminence into the Secrets of Nature, about the ſame Time. The ever memorable *Harvey* engaged himſelf particularly in the Study of Generation. He purſued the moſt unerring Means to find out the true Nature of the Subject, and indefatigably went through the moſt laborious Operations and Diſſections leading to it; obſerving, with the greateſt Conſtancy and

Sagacity, the Progreſs of Nature in the Propagation of Animals; eſpecially in Eggs * in a State of Incubation, of which he moſt diligently watched every Alteration from the Beginning to the Exit of the Chick. Whereby he was able to fix his Principle, turn his Back upon former Errors, and lay down ſuch a Path as was ſufficient to lead future Anatomiſts and Philoſophers into more certain Ways of finding theſe Truths, than ſome at preſent ſeem to be engaged in.

After what this great Author had produced upon the Subject, it is ſomewhat

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* In the Year 1625, *Joſephus de Aromatariis* publiſhed a Tract which is intitled, *Diſputatio de Rabie contagioſa*, to which he prefixed an Epiſtle concerning the Generation of Plants from Seeds; wherein it appears he was ſenſible that *Plantulæ* are formed in the Seeds, and that Chickens are already formed in the Egg in the ſame Manner. This came out in *Venice*, and the Year after was publiſh'd at *Francfort*; which was the very Time of the Publication of the Works of *Hieronymus Fabritius ab Aquapendente* at the latter Place.

ſtrange to find Authors now talk of an Admixtion of ſeminal Matter of both Male and Female to produce an Offspring; but it would have been a prudent Step, in ſuch as aſſert this Doctrine, to point out how and where ſuch an Admixtion can be made, before they advance ſuch a Notion. Every real Anatomiſt knows that the *Uterus* in human Bodies, in a Virgin State, is very ſmall; that its Subſtance is is very thick, and conſequently that its Cavity, which conſiſts only of two little angular Surfaces lying cloſe together, is ſo ſmall and inconſiderable, as not to be capable of containing even a few Drops of any kind of Fluid. Again, it plainly appears by the Structure of the *Cervix Uteri*, that nothing was ever intended to paſs from without, that is, from the *Vagina* †, into it; becauſe it is extremely narrow and pretty long, and has Glands within to afford a ſtrong *Mucus*; and *Striæ* and Wrinkles to which this Matter adheres, in order to ſecure and ſtop up the Paſſage from even the Ingreſs of the Air. That therefore the little *Fœtus* muſt come into it ſome other Way, and indeed Nature has kindly provided two, which are the *Fallopian Tubes*; and that theſe are the only Ways cannot be deny'd, becauſe we ſometimes find *Fœtuſes* in thoſe Tubes, which, altho' they are contain'd in *Ova*, very minute Globules, when they are firſt detached from the *Ovaria*, often lie there, and grow very large, when once obſtructed in their Paſſage towards the *Uterus*; and theſe are what are called *extra uterine* Conceptions *; of which ſeveral Authors have given various Accounts.

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† If the *Os Tincæ* and *Cervix Uteri* were as eaſy to be relax'd and open'd as the wild Imaginations of ſome would perſuade the World, no Conception could be long eſtabliſh'd; for, as ſoon as it acquired a little more Bulk and Gravity, it would readily force

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force them open, and Abortions would be innumerable. But this was never the Deſign of the Creator, but rather the direct Contrary, which an Anatomiſt will eaſily ſee Reaſons for in the Structure of the Parts.

* De Conceptione Tubaria, qua humani Fœtus extra uteri cavitatem in Tubis quandoque

This being the Caſe beyond Contradiction, the Fœcundation of the *Ova* muſt

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doque concipiuntur, *&c.* Authore *Johanne Sigiſmondo Elſholtio*, extat cum Miſcellan. curioſ. ſive Ephemerid. German. anno 4^{to} & 5^{to}.

Vide etiam *Mathei Tillingii* Exercitationem anatomicam de Tuba uteri, deque Fœtu nuper in Gallia, extra uteri cavitatem, in Tuba concepto, *&c.*

Vide *Regnerum de Graafe* de Mulierum organis generationi inſervientibus.

See alſo the *Tranſactions of the Royal Society*, and other Authors. Mr. *Ruiſch* ſhew'd an *Ovum* but a little while detached, the End of the *Fallopian Tube* being turn'd towards the *Ovarium* to receive it, and an Experiment of that able Anatomiſt *Nuk* puts this Opinion out of Diſpute. He found two Eggs very much enlarged in the *Ovarium* of a Bitch; he made a Ligature on the Tube of the ſame Side, and heal'd the Wound, and twenty-one Days after, having open'd the Bitch, he found two *Fœtuſes* in the Tube between the Ligature and the *Ovarium.*

be made in the *Ovaria*, which cannot poſſibly be from an Admixtion of groſs ſeminal Matter, becauſe none can arrive at the *Ovaria* by any Means; for, if the *Os Tincæ* and *Cervix Uteri* were quite open ſo as to admit that groſs Matter into it, yet no given Force could ſend the leaſt Particle into the *Fallopian Tubes*, the Ingreſs of which into the *Uterus* is ſo ſmall, as to eſcape the moſt nice Attempts to find their Holes, or Paſſage from the *Uterus* into the *Tubes*; and are ſo contrived as not to ſuffer even Wind to paſs out. And indeed it is with much Difficulty that it can be forced open from the *Tube* into the Womb. And even in the very laſt Month of Pregnancy, when it is diſtended to its utmoſt Extent, yet theſe Holes or Paſſages are ſtill cloſe; and as, the more the Bladder is filled with Urine, the cloſer are the Paſſages into it compreſſed, in order to hinder a Regurgitation of the Urine into the *Ureters*; ſo the Preſſure of the Membranes that contain the *Fœtus* upon the Valves of theſe Holes, together with the natural cloſe Structure of the Holes themſelves, render them as ſtraight as they were, when the *Uterus* was in a Virgin State, notwithſtanding the great Diſtention it ſuffers, during the Time of Geſtation.

Hence we may boldly conclude, that none of the viſible groſs ſeminal Matter that is injected by the Male, can ever enter the *Uterus* *, and that, upon the firſt Exerciſe or Motion of the Female, it is rejected and falls out of the *Vagina*, ſeemingly in the ſame Quantity as it was injected; and conſequently that there can be no Aſſemblage of that Matter of the

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* Therefore it would be extreme Nonſenſe to imagine that the inſignificant Animals, commonly call'd *Spermatic Animals*, can contribute any thing towards Propagation, which they were thought to do by many, after what *Leuwenhoeck* had wrote about it. For, if the Vehicle in which they ſwim cannot paſs, how can they reach the *Ovarium*; but, if they could reach it, by what Mechaniſm could they penetrate the *Ova*, and not loſe the incloſed Fluid? But ſuch low Conjectures deſerve not to be confuted by Argument.

Male with any pretended *Semen* of a Female, on any Account whatſoever. Our great *Harvey* knew this very well, by his frequent Inſpection of other Animals as well as the Human; it is therefore much to be wonder'd, that neither what the learned Members of the *Lyncean* Academy had obſerved, the Hints given by *Hieronymus Fabritius*, and the further moſt ſagacious Obſervations of the ever famous *Harvey*, ſhould be ſufficient to prevent ſuch inadvertent Relapſes into the Notions of inveſting Matter with the leaſt Power of diſpoſing and directing itſelf, or of the moſt remote Probability of any Admixtion as is before often mentioned; or that the Knowledge of the Structure of the Parts of Animals, ſerving to their Procreation, is not of Force enough to prevent Authors from running back into thoſe obſcure and unintelligible Syſtems, which the Learning and Sagacity of the glorious Writers above-mention'd had taught them to ſhun.

Now no Fluid of the Female can come into the *Vagina*, at the Time of the *Coit*, but from the *Lacunæ*; and it is this which is deſtined only to lubricate the Paſſage, and cauſe much of the Senſations proper to the Occaſion in paſſing theſe *Lacunæ*; but, if we would ſuppoſe that lubricating Fluid to be ſeminal, yet to what Purpoſe could it ſerve, when it muſt be carried off out of the *Vagina*, together with the ſpermatic Juice * of the Male, upon the firſt Motion of the Female? Again, if it be pretended that the little *Ova* in the *Ovaria* contain Seed, how can it come down to meet that of the Male, and where can it be retain'd? Not in the *Uterus*, for the natural Reaſons above-mentioned; not in the *Vagina*, for whatever is thrown in there, is abſolutely ejected in a few Minutes after; and this leads me to the Deſcription of the *Ovum* that comes into the Womb of a viviparous Animal, whatever may have been ſaid to the contrary, by thoſe who have not been happy in frequent Opportunities of viewing and conſidering theſe Things, nor are poſſeſſed of the neceſſary Qualifications for making ſuch Obſervations on Animal Bodies.

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* For theſe *Lacunæ* are all below the *Uterus* in the *Vagina*, which makes it impoſſible for the lubricating Fluid to be carry'd up into the *Uterus*, or any where elſe but out of the *Vagina*, with the groſs Male *Semen*, after its *Effluvia* have left it, as will be explain'd in the next Chapter.

An *Ovum* of a viviparous Animal conſiſts of Parts containing and ſuch as are contained. Thoſe containing are Membranes, the *Chorion* and *Amnion*; the *Chorion* is the External, having, on a Part of its Surface, the *Placenta* in its Rudiments, which are the *Radiculi* of the Parts contained. The *Amnion* is the Internal, on whoſe Surface the Veins and Arteries appear, proceeding from the little *Radiculi*, and at laſt uniting to form two Arterial Trunks, and one large Vein: Which three Veſſels, being inveloped in a mucous Caſe formed out of the Membranes, make together the umbilical Cord, at the Extremities of which the little Organization of the *Fœtus* grows; and theſe, together with the Waters that environ the *Fœtus*, are the Parts contained.

This is the true State of an Egg, as it grows from its Hold in the *Ovarium*, in its moſt minute State; and it is exactly the ſame without the leaſt Alteration, even in the laſt Month of Pregnancy in the Womb. Now to wound or break theſe Membranes by any Means, which repreſent a Bladder full of a Fluid, would be to let the Fluid out; this done when minute in the *Ovarium*, the Membranes collapſe, and the little Organization periſhes. And thus, after an Egg has paſſed the Tube, and has got into the *Uterus*, if by any Accident the Membranes break, the Waters run off, and an Abortion muſt inevitably follow, at any Time of Pregnancy: And, in a Word, thus at the Completion of the Time of Pregnancy when Labour comes on, the Child commonly ſoon follows the Breaking of theſe Waters. Hence, one may naturally conclude, nothing can paſs through theſe Membranes of any kind whatſoever without deſtroying them.

That this is the Caſe, every one duly verſed in theſe Things muſt confeſs; what then can infatuate any one to imagine, that the *Liquor Amnii*, in the little *Ovum*, ſhould be ſeminal Matter, any more than it is ſo, when the *Ovum* is ready for the Birth? Where is it poſſible for an Admixtion to be made between the groſs Male Sperm and this little *Liquor Amnii*; and to what Purpoſe could it ſerve, if they could come together?

If it be pretended that the ſpermatic Matter of the Male contains Particles which are organical, and that theſe have a Power of combining in a certain Manner to form a *Fœtus*; is it not very like ſaying that a Concourſe of *Atoms* combine to produce every Thing? We have long ago had Authors who dreamed, that there were Particles deduced from all Parts of the Body, and aſſembled in the *Teſtes* of the Males, and the miſtaken *Teſtes* of the Females; Eye Particles from the Eye; Noſe Particles from the Noſe; and ſo on of the reſt, to form the *Proles*; but theſe were far leſs excuſable than the famous old Writer *Hippocrates*, by whom they were taught this very Doctrine.

He indeed tells us in different Parts of his Works, in one Place that *Semen* flows from all Parts * of the Body, or from all the Moiſture contained in the Body. That † healthy Seed proceeds from healthy Parts, and unſound Seed from unhealthy Parts. And from hence ſprung ſeveral falſe Concluſions; as that, ſince it is neceſſary that Particles ſhould come from every Part ſpecifically, to form a compleat Animal in the Womb; it muſt neceſſarily follow, that the maimed or lame Parent ſhould beget a maimed or lame Child; a Man who had by Accident loſt a Leg, Arm, Eye, or Ear, ſhould beget a Child wanting theſe Parts; and ſo on of other Things of this Nature.

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* Libro de Genitura, §. 3. pag. 231, 232. apud *Foeſium*.

† De Aere Locis et Aquis. § 3. pag. 289. vide Editionem *Foeſii*. Fol.

But how weak do we find ſuch Notions, weak to a moſt ſcandalous Degree! For it is well known, the Lame, the Blind, and the Earleſs produce Children perfect in all Reſpects before us every Day; and on the contrary, the beſt form'd Couple often produce a Child imperfect and disfigured; which could not be the Caſe, if this was the true Syſtem.

We alſo know the Blood to be a general Maſs, from which the different Humors of the Body are ſeparated by their proper Glands, the Manner of which will be explain'd hereafter; and conſequently, that, when it flows to the *Teſtes*, it depoſits there nothing but the ſpermatic Fluid, which we ſhall ſhew to have no other Office, in the Propagation of an Animal, than to be the Vehicle, only, of a more pure and ſubtile vivifying Spirit; not to form a Body out of the Matter, but to fœcundate that which is already form'd in the *Ovarium*. It was * alſo imagined by *Hippocrates*, that the *Semen* proceeds from the Brain and ſpinal Marrow; that it flows from thence into the Loins, and thence into the Reins, and thence through the *Teſtes* to the *Pudenda*. And, * again, in another Place he tells us, that Veins paſs from the Head on each Side to the *Teſtes* and carry *Semen* to them; ſo that he has ſettled two Ways for the Paſſage of ſeminal Matter to theſe Organs, *viz.* the ſpinal Marrow, and the Veins behind the Ears. Theſe and ſuch-like Conjectures gave Occaſion to his telling us two very particular Stories, of which we will leave the Anatomical Reader to judge of the Truth. The firſt is, that the *Europeans* had among them a certain Species of People, whoſe Heads † were very large and long, who were eſteem'd as a generous noble-ſpirited People; and that it was a Cuſtom among Nurſes, in order to cauſe their Children to grow long-headed, to uſe Methods of binding and compreſſing their Heads, whilſt young and ſoft, and at laſt that they grew into *Macrocephali*, who alſo begat others with long Heads, and they others, and ſo on; ſo that, ſays he, what was at firſt the Effect of Faſhion and Cuſtom, became at length a Work of Nature. At this Rate every accidental Depreſſion, or Gibboſity, on any Part of the Body of an Animal, ought to be communicated to its Offspring, and become natural, or any other defective Form whatever; and indeed even the Sizes of Perſons would be influenced to follow the ſame Rule. No little Man could ever produce a Son or Daughter larger than himſelf; nor a tall Perſon, a ſmaller; no crooked Perſon a ſtraight, nor no ſtraight Perſon a Child of ill Form; and yet every Nation and People, upon the Face of the Earth, ſhew the contrary to theſe, in ſome Reſpect or other.

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* De Offium Natura, pag. 278. apud eundem.

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* Lib. de Genitura, pag. 232. apud eundem.

† De Aere, Locis & Aquis, p. 289. apud eundem.

The Second is that the *Scythians* * were a People much inured to Riding, by which they often brought on great Pains in the Loins, Back, *&c.* and uſed to be let Blood behind the Ears, in order to take away thoſe Ailments; now *Hippocrates* brings this as a Reaſon why many of them are rendered barren; becauſe, ſays he, by this Means, theſe Paſſages of the *Semen* which lead from the Brain to the Loins are obſtructed.

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* De Aere, Locis et Aquis, pag. 293. §. 3. apud eundem.

But there is a modern Doctrine * which has no ſmall Reſemblance to this, and is certainly very particular; the Author of which, in one of his Chapters, endeavours to give Reaſons why Negro's are Inhabitants of the *Torrid Zone*, and why Dwarfs

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* *Venus Phyſique, Seconde partie. chap.* vii. The Author of this Work has ſhew'd great Learning and Ingenuity in his Conjectures thro' the Whole, one of which, concerning the Formation of the *Fœtus*, in the 17th Chapter of the firſt Part, conſiſts in a Compariſon made between that and the Formation of the *Arbor Dianæ*: He ſays, that, upon mixing the *Siver*, and *Spirit of Nitre*, with *Mercury* and *Water*, theſe Materials come, of themſelves, to range into the Form of a Tree. To this he adds ſome others of the ſame kind, mention'd by the *Royal Academy of Sciences*, for the Year 1705, pag. 415. from which, by Way of Inference, he ſays: " What Miracle! if ſuch a Vegetation ſhould " be

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“ be form'd out of the reach of our View;
“ for that it is Cuſtom alone that diminiſhes
“ the wonder of the greateſt Part of the
“ Phœnomena of Nature;” which I cannot apply any other Way, than that he ſeems to think the Particles of the *Semen* are alſo capable of ranging themſelves to form a *Fœtus*. The Sequel of this Work will bring the Matter to a more certain Concluſion. However, if this be his Meaning, we muſt make ſome Diſtinction here concerning it: Mineral Bodies are inorganical, and their Particles hard and rigid; which ſeem to me to have been form'd, in genneral, by Appoſition of Particles, or by Condenſation of certain Fluids; Animal and Vegetable Bodies are Organical, and grow before us, in Size, by a meer ſupply of nutritious Fluids paſſing thro' their Veſſels; and as to their original Formation, the Sequel will ſatisfy the Reader in that Reſpect. So that there ſeems to me no uſe of the *Arbor Dianæ*, in explaining the Propagation of either Animals or Vegetables.

and Giants are confined to the *Poles*; which I here preſent the Reader with in *Engliſh*, as a Specimen of the Work: "We yet ſee other Monſters born among "ourſelves, which very likely are but "fortuitous Combinations of Particles "of the ſeminal Matter, either from the "Effects of too powerful or too weak an "Affinity between them: Men of an ex-"ceſſive Largeneſs are a kind of Monſters, "but which would become a peculiar "People, if Pains were taken to multi-"ply them. If what Travellers tell us "of the *Terra Magellanica*, and of the "ſeptentrional Parts of the World, be "true, theſe Races of *Giants* and *Dwarfs* "ſhould be eſtabliſh'd in thoſe Places; "either on Account of the Convenience "of the Climate, or rather becauſe that "in the Time, when they began to ap-"pear, they would be driven into thoſe "Regions by the reſt of Mankind, who "would be afraid of thoſe *Coloſſus*'s, "or ſcorn thoſe *Dwarfs*. Let Giants, "Dwarfs, or Blacks be born among "other Men, Pride or Fear will arm "the greateſt Part of Mankind againſt "them, and the moſt numerous Species

" will baniſh thoſe deform'd Races into
" the moſt uninhabitable Climates of the
" Earth; the Dwarfs will retire towards
" the *Arctic Pole*, the Giants will inha-
" bit the Land of *Magellan*, the Blacks
" will dwell in the *Torrid Zone*."

All theſe kinds of Doctrine (the Baniſhments of theſe Races of People excepted) ſeem to be derived from the ſame Fountain; *Hippocrates*, when he firſt broached them, was unacquainted with the Structure of the Body, and indeed was as little verſed in the Science of Geography, and is therefore greatly to be excuſed in many ſuch Conjectures as he made for Want of theſe Qualifications *; but was it his Fate to live in our Time, and was his Knowledge in thoſe Particulars equal to his great Sagacity and Induſtry, how would he have bluſhed to have laid down ſuch Opinions to the World, and to have led ſo numerous a

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* Yet, in thoſe Matters which depended upon his Obſervation alone, there never was his Equal; as appears by his Aphoriſms, Preſages, &c.

Train of Writers aſtray; and what Care would he not have taken to revoke ſome Parts of his Works, which are eſpouſed as the *Sacra Pagina*, with ſo warm a Zeal, even at this Time? However, we ſhould be much obliged to the learned Author of the above Quotation, if he were ſo kind to the World, as to ſettle the Chronology of the Riſe and Baniſhment of the Giants, Dwarfs, and Blacks, as well as the ſeveral Roads by which they paſſed into the Countries mentioned, and how they were conducted.

We muſt farther obſerve, that, from the ſame Source, the Opinion of the great *Deſcartes* * was: That Man was form'd from a Mixture of Liquors expended by both Sexes. It will be proper to give his Thoughts of it in a Tranſlation of his own Words, which are as follows: "It will be ſufficient to ſay that the "Seeds of Plants, being hard and ſolid,

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* Tractatus de Formatione Fœtus, Pars quarta, de partibus quæ in Spermate formantur. §. xxvii.

“ may have their Parts, in ſuch a cer-
“ tain Manner, ſituated and diſpoſed, as
“ not to be capable of being changed,
“ without being render’d unprofitable.
“ But not ſo of the Sperm of Animals,
“ which being very fluid, and chiefly
“ produced by the Conjunction of the two
“ Sexes, it ſeems to be no other than a
“ confuſed Mixture of two Liquors,
“ which, as they are mutually diſpoſed to
“ ferment with each other, become ſo
“ hot, as that ſome of their Particles
“ acquire an Agitation equal to that of
“ Fire, are dilated, and preſs others,
“ and by this Means diſpoſe them
“ by Degrees, in that Manner which is
“ moſt requiſite, to the Formation of the
“ Limbs. Nor is it at all neceſſary that
“ theſe Liquors ſhould be very different;
“ for Experience ſhews us that an old
“ Maſs of ſour Dough will ferment with
“ that which is new; and that the
“ Grounds or *Fæces* of Beer will ſerve
“ to ferment new Beer; * thus it is eaſy
“ to

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* If it were poſſible to ſuppoſe any Female *Semen* to exiſt, yet this Author’s Analogy ſeems not to be juſt; for, even in that

to believe the Sperm of the two Sexes mixed together, ſerve to ferment each other.

He

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that Caſe, the ſeminal Fluid of both would be a recent fluid, and equally ſweet and inſipid; how then ſhall it ferment for Want of Acids or *Fæces*, *&c?* And indeed it would be very miraculous to find Particles of Matter qualified, by ſuch inteſtine Motion, to range themſelves together, firſt to form a Heart, with all its Auricles, Ventricles, and other Parts, and then others in Succeſſion to that, till an Animal is completely made. But ſuch a regular Adjuſtment of Particles rather implies a meer Act of Volition in every Individual itſelf, than that they ſhould be driven into the glorious Order of compoſing an Animal, by a crazy Fermentation, or any other imaginary Motion whatſoever; and as Dr. *Bentley* ſays, in his ſecond *Boylean* Sermon: “ Every ſingle Atom of our Bodies would then be a diſtinct Animal, endued with Conſciouſneſs and perſonal Senſation of its own. And a great Number “ of ſuch living and thinking Particles could “ not poſſibly by their mutual Contact, and “ and Preſſing and Striking, compoſe one “ greater Individual Animal, with one Mind

“ and

He further compares this ſuppoſed Fermentation to that of new Wine, or Hay put up, while it is yet damp; and ſays, that the Heat cauſes ſome Particles to come together, towards ſome Place of the Space in which they are comprehended; and, there dilating, compreſs the circumbient ones, whereby the Heart begins to be formed. Thus argues this great Philoſopher, and thus he goes on to explain how every Part is formed thro' the whole Animal Body. There is an unhappy Diſpoſition in ſome Men to give Credit to Things, for no other Reaſon than becauſe they are incomprehenſible, and to reject Things more eaſily underſtood. This Doctrine of *Deſcartes* ſeems to have gain'd the Approbation of the learned Author of the little Book above quoted; he ſays, " The Sentiments of *Deſcartes*

" and Underſtanding, and a vital Conſenſion " of the whole Body; any more than a " Swarm of Bees, or a Croud of Men and " Women, can be conceived to make up one " particular living Creature, compounded and " conſtituted of the Aggregate of them all."

"upon the Formation of the *Fœtus* by "the Mixture of two Seeds has ſomething remarkable in it, and which prejudices much in its Favour, if moral "Reaſons can have any Weight in the "Matter: For it cannot be ſaid this Philoſopher embraced the Opinion, in Complaiſance to the Ancients (whoſe Opinion by the by it was very near) or "that he was not capable of inventing "other Syſtems. But if we believe that "the Author of Nature does not give "up the Formation of Animals to "the Laws of Motion alone; if we believe it is neceſſary that his immediate "Hand ſhould be upon them, and that "he has created all theſe Animals, the "one contained within another: What "Advantage is there in believing they "were all formed at the ſame Time, "and what Loſs will Philoſophy ſuſtain, "if it be thought that Animals were "formed ſucceſſively? Is there (even "with Reſpect to GOD) any Difference "between the Time which we look upon as the very ſame, and that which "ſucceeds?"

To theſe ingenious Conjectures it is eaſy to anſwer; we grant, him, that there can be no Difference of Time, Place, or any Thing elſe in the Univerſe, with the great Author of Nature; all Things are equally in his Power, nothing is greater or leſs; an infinite Expanſion of Space and an eternal Duration are peculiar to the GOD of infinite Power. It is with us, his Creatures that Magnitude, Duration, Space, and Judgment are ordained to be relative and confined. It is with our limited Natures that the Qualities of Things can appear exceſſive, as to Heat, Cold, Sweetneſs, Bitterneſs, Strength, Weakneſs, Moiſture, Siccity, and all others. But then, ſince this relative Sphere is the Rule by which we are to comprehend Things and from our Judgment, there can be no Doubt but we have it granted to us truly to diſcern the relative Sizes, Duration, and Qualities of Bodies, as far as our Circumſtances and Neceſſities, in the Station we are to occupy in this Life, require; and it muſt appear Matter of great Moment to us, to know we are able to diſtinguiſh them; and altho' we cannot conceive how, from the Creation, all Animal and Vegetable Beings that ever have been, or ſhall hereafter appear in the World, might be contained in the firſt of each particular Species, yet that more than all this is in the Power of the GOD of all Things is moſt true; to whom, after all our weak Reaſoning, we muſt at laſt have Recourſe; with whom the Concreation of Animal and Vegetable Beings cannot be impoſſible, however incomprehenſible it may ſeem to the moſt wiſe *Materialiſt* among Mankind. Nor can I diſcern even this more difficult for Mankind to conceive, than that the moſt tranſparent Water ſhould contain a World of Animals which the moſt penetrating Eye can not diſcern; and which is altogether as incredible to ſuch as are unacquainted with the Uſe and Power of the Microſcope, and equally marvellous, when diſcovered, as that a Concreation ſhould have been brought about by an Almighty Power. However, notwithſtanding I believe it poſſible with the *Creator*; yet, in the enſuing Chapter, I ſhall remove that Stumbling-block which the Doctrine of a Concreation has thrown in the

Way, by ſhewing there was no Need of it; and that Animals and Vegetables are continually propagated in Succeſſion to each other hitherto, and muſt go on in the ſame Way, during the Will of the *Creator*.

CHAP. II.

The Author's own Opinion of the Manner of the Propagation of Animals and Vegetables, by primary Organizations.

I AM now come to ſhew, that there is no Manner of Need for being puzzled about a *Concreation*; that is, that an Egg does not contain within it the Animals and their Eggs, nor a Seed the Plants and their Seeds, to a Number of Ages to come; for the Confuſion of Notions, that ariſe from this Doctrine, only ſerves to perplex the beauteous *Order* and *Simplicity* that we ſhall ſhew to be in the ſeveral Advances of the great Work of *Propagation*. We ſhall grant therefore, that there was no ſuch Concreation of Seeds or Eggs upon the firſt Creation of Animals and Vegetables; but that every Animal and Vegetable, at its firſt Creation, was only made capable of bringing forth its Offspring according to its Kind in a ſucceſſive Series, from

Age to Age, by the Divine Author, each Kind being confin'd to its own certain Limits of *Form*, *Features*, *Taſte*, *Smell*, *Colour*, and, in a Word, all other Qualities and Characters, which the almighty FIAT had at firſt impreſſed upon it; beyond which it cannot go, and from which it can never alter eſſentially. This I ſhall make more plain and evident to the meaneſt Capacity than any other Syſtem can admit of, in accounting for the Nature of Propagation.

The Uniformity of Structure and Increaſe between *Animals* and *Vegetables* is very aſtoniſhing; and the Order and Oeconomy, in which they are carried on, are amazingly alike; and, however oppoſite ſome ingenious Men may be to any Endeavours to account for the *Phænomena* that relate to it by their *Analogy*, Opinions are free, and, in many other Things as well as this, he that has no Opinion of his own ſeems not to bid very fair for making an Improvement in natural Knowledge. The Chain of my Arguments, thro' this little Work, ſhall be carried on Link by Link, in Search of the Myſtery of Propagation by *Analogy.* It is by this, and the many viſible Facts attending it, which are ſo glaring and plain to the View of every impartial Obſerver, that I do not doubt being able to bring many Truths to Light which muſt inevitably have lain hid for ever, if not ſearched for through this Channel of *Analogy.*

To begin then, let us firſt take a View of the *Eggs* and *Seeds* of Animals and Vegetables, which are Subjects obvious and plain to every one's Senſes; and from which we can ſee Animals and Vegetables grow before our Eyes in their proper Seaſons, and according to their Kinds; and which no one can deny without calling his own Senſes in Queſtion. And, ſecondly, let us go a little back, and endeavour to ſhew, how theſe *Eggs* and *Seeds* come to be formed and made complete and fit for being treaſured up, in order to their further *Propagation* at any proper Time.

In the Animal Syſtem the *Roes* of Fiſhes, the Eggs of Inſects, and thoſe of all Kinds of Birds, and all other Animals are alike in all Reſpects. They are for the moſt Part roundiſh compact Bodies, or of ſuch convenient determinate *Forms* as ſuit their Natures; they all have Integuments nobly contrived for their Preſervation; thoſe deſigned for Extruſion, and to be preſerved out of the Body, with hard or otherwiſe very compact Coverings to ſecure them from external Injuries; thoſe to be treaſured up in the Body, with their proper Coverings alſo, but ſoft and membranous, as being already ſafe enough from any external Dangers. Every Individual Kind contains its own peculiar Subſtances, always differing ſpecifically from that of every other Kind in Taſte, and all other Qualities and Reſpects. All theſe Characters are proper alſo to *Seeds* of every Kind; they have their natural Coverings, more or leſs compact according to their Neceſſities; their *Forms* are complete and convenient; the Subſtances they contain are alſo peculiarly and ſpecifically different from thoſe of each other in all their Qualities; and their Offspring proceeds from them in the ſame Manner as Animals proceed from their Parent Eggs.

Theſe are Truths which we may preſume no-body can deny; to which we muſt add another as evident, and that is, that, beſides the ſeveral Subſtances ſaid before to be peculiar to every *Seed*, there is alſo a peculiar *Organization* treaſured up in each; which is no other than the Rudiment of the future Tree or Plant, capable of being propagated into ſuch a Tree or Plant as it ſprung from, and no other, according to its Kind. If this be doubted, here are many Evidences to prove it: The Seed of the *Acer maximum* contains in its Pod, which is lin'd with a fine ſilky Down, a *Plantula* of a conſiderable Bigneſs, conſiſting of a *Pedicle* and two long Leaves, each about three Quarters of an Inch long, between which, the viſible *Bud* of another Part of the Organization appears ready to be propagated. In every one of the *Nut* Kinds, and all the *Fabaceous* and Pulſe Kinds in general, there is a viſible Organization peculiar to each Species, treaſured up in the ſame Integuments, together with the other Subſtances proper to it (of which we ſhall ſpeak more in the Sequel of this

Work) and, in a Word, the moſt minute Seeds whatſoever are furniſhed with their little Organizations, however minute they may be. Surely, when ſuch Organizations appear before us in every Seed, which is large enough to be view'd clearly, it would amount to almoſt a Madneſs to deny their Exiſtence in the moſt minute, only becauſe we may not have the Power to ſee them; eſpecially too ſince in every Part of the Courſe of their Growth, Fructification, *&c.* as well as Propagation, there appears to be no Difference between them and thoſe whoſe Organizations are viſible. There are Multitudes of Seeds which produce very large Plants, and yet, from their Minuteneſs, appear only like *Duſt*, as thoſe of the *Vanelloes*; and a vaſt Number which almoſt eſcape our Sight, without the Help of a good Microſcope, as the *Ferns*; and yet theſe have their beauteous peculiar Forms and Marks, and, without the leaſt Doubt, their *Organizations*, as well as their other natural Subſtances.

Now to what Purpoſe are they always thus placed in thoſe Seeds? Certainly, if the other various Subſtances, contain'd in them, could by the Help of the *Vis Plaſtica*, or any other concomitant or inherent Power, be ſo ranged as to produce from the Combination of their Particles ſuch another Tree or Plant, there was no Need of little *Organizations* to be included with them; but we ſee before us, every Day, that it is from theſe *Organizations* the ſucceſſive Tree or Plant is produced, let its *Form* or *Appearances* be what they will.

Now the Queſtion is, From what are theſe *Organizations* produced? And in this lies the whole Myſtery, which, when made plain to every Underſtanding, will remove thoſe Clouds that hitherto have obſcured the Knowledge, we ought to have had of this great *Phænomenon* long ago; and render all former Conjectures, from the Beginning to this Day, trivial and weak; and alſo ſhew, that this Part of the Works of the Great God, how marvellous ſoever, are to be underſtood, and are eaſy and ſimple to thoſe who can endeavour to explore them with Minds free from Corruption and Prejudice; viewing Things as they really are, and not obſcuring them with vain Conjectures and Hypotheſes, which lead to an Infinity of Errors, and thence to the utmoſt Impiety; for theſe Things are well within the Sphere of our Underſtanding; thus far we are permitted to go, and theſe are the Means by which we come to the Knowledge of the true GOD and Maker of all Things.

But to begin the Explanation of our own Thoughts about it; that is, to know how every Animal brings forth Animals, and every Tree or Plant brings forth Trees or Plants after their Kinds; we will take into our View a *Tree* and an *Animal*, and conſider them alternately through every Stage, from their *Eggs* to their utmoſt *Growth*; and, in ſpite of Obſtinacy itſelf, we ſhall ſee exactly the ſame Plan purſued by Nature in the Production and Progreſs of both.

Let us then behold a young *Tree*, and obſerve how it puſhes forth its Leaves and Flowers; it is, while young, to be accounted but imperfect; and is only completed, when it has extruded an entire

Set of Boughs and Branches; after which it may grow larger, tho' not more complete. One Part is explicated regularly after another, from the firſt Shoot till it comes to Perfection; which we ſhall further explain hereafter; and, when it has grown thus far, it is then, and not before, capable of producing *Seeds*, containing the *Rudiments* and Subſtances of other Trees like itſelf. The *Fibres* of its general *Organization* are ordain'd to grow into little *Nodes* or Implications, ſome to form Leaves, ſome the *Calyx*, ſome the *Petals*, ſome the *Piſtil* and *Utriculus*, ſome again the little *Ova* or Seeds; each growing from its own Pedicle, even the moſt minute as well as the greateſt, and in whatſoever Number contain'd in the *Uterus* of the Tree or Plant; and, for the Male Parts, other *Fibres* are terminated into *Stamina*, and from theſe again other *Fibres* are terminated into *Apices*; and, again from theſe, others terminate into the minute *Grains* commonly call'd the *Farina fœcundans*; each little Grain growing upon its own Pedicle, no otherwiſe than we ſee the Leaves of Trees or their Fruits growing, and in due Time falling off, that the Uſes for which they were firſt deſigned ſhould be fulfilled.

Exactly in this Manner we ſee an *Animal*, which, while it is young, is ſtill imperfect, approaching more and more to a Degree of Perfection till it is entirely explicated, and grown complete in every *Organ*; each Organ, whether internal or external, being but the Continuation or Termination of the general *Organization*, according to the Neceſſity and Uſe of each; and thus, after its Completion, it may yet grow larger, tho' not more perfect. And, when it has proceeded in its Growth thus far, each Female is then, and not before, capable of producing its *Ova* or *Seeds* from the *Ovaria*, each ariſing from, and being a Continuation of, the general *Organization*, growing upon its own Pedicle, in order to drop off in due Time, to anſwer the Ends for which it was made; and each Male at this State of Perfection, and not before, being capable of producing from itſelf the *fæcundating Matter* neceſſary for the Propagation of other Animals of its own Kind.

Now I think it will not be improper to give ſome Reaſon, in this Place, why Animals have not a Power in themſelves, as it is in ſome of the Vegetables, to propagate their own Species. This might probably have been the Caſe in Animals, if there were not ſeveral noble Ends to anſwer in them, which were not at all neceſſary in Vegetables. Vegetables are fixed where they grow, and therefore it was neceſſary the Fœcundating or Male Parts ſhould be either in the ſame Flower with the Female Parts, or ſituated ſo near * the Female Flower as that the

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* The Diſtribution of the Flowers of Trees and Plants are of three Kinds: (1.) *Male* and *Female* Parts in the ſame Flower; (2*dly*,) ſeparate *Male* and *Female* Flowers in the ſame Tree or Plant; (3*dly*,) *Male* Flowers alone in one Tree or Plant, and *Female* Flowers alone in another of the ſame Species. The true Reaſons for this Variety ſeem to be, firſt, that the Power of GOD might be made more manifeſt; and, ſecondly, as the *Farina* of the different Vegetables may be more or leſs

the *Farina fæcundans* might be conveniently and certainly convey'd to it, in order to the Fœcundation and Propagation of the Species; but in Animals this was not neceſſary; they can approach each other, and have Organs ſo diſpoſed and qualified, as, at certain Times and Ocſions, to excite them to a Deſire of coming together; which truly points out that a ſocial Congreſs was the Deſign of the CREATOR for Animals, and that a mutual Satisfaction ſhould be the Reward attending the Act of Propagation. One can hardly avoid being of Opinion, that, if no ſuch Reward was connected with it, a Succeſſion in the Animal World would

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leſs qualified for being wafted to Diſtances from their native Place, that thoſe leſs qualified ſhould be placed near their Female Parts; thoſe more ſo, at greater Diſtances; the Forms of the ſeveral *Grains* or *Globules* of the *Farina* may, perhaps, ſhew theſe Reaſons to be juſt. Every Part of Nature, if carefully obſerved, will appear to be founded upon ſuch Reaſons as are obvious enough to the Share of Underſtanding we are guided by in this Life.

ſoon be extinguiſhed, how neceſſary-ſoever the Propagation of Species might be; but, however, the DIVINE AUTHOR of Providence has annexed ſuch Conditions to it, as are perſuaſive enough even to the moſt malignant Heart to aſſiſt in producing his Species; who, perhaps, would otherwiſe remain unconcerned at the Deſtruction and Extirpation of the reſt of Mankind; and who would even want Good-will enough to propagate a Creature, tho' he receiv'd his *Being* from the meer Benevolence of his Divine Maker.

Now, to ſhew further that a Congreſs between the Male and Female, of the Generality of Animals, was neceſſary, let us only obſerve theſe two Claſſes of Creatures, *Snails* and *Earth-worms*; each of which, though it has, in itſelf, the *Male* and *Female* Parts for Propagation, yet is utterly incapable of Self-fœcundation, and therefore ſeeks a Companion for Coition; each impregnates the other reciprocally, and both bring forth their *Eggs* or *Young*. And, as the moſt exquiſite Wiſdom appears thro' all the Operations of Nature, ſo, in this, theſe *Phænomena* appear

pear moſt neceſſary and rational; for, 1*ſt*, theſe Creatures are exceſſively ſlow in their *Loco-Motion*, and conſequently their *Congreſs* very ſeldom happens; and, beſides, 2*dly*, they are ſubject to ſo many deſtroying Accidents, from the Care of the Huſbandman and Gardener, as well as from the devouring Appetites of many Species of the Fowls of the Air, that, if the Female Properties were but in one ſingly, and the Male Parts were ſingly confin'd to another, it would not be ſufficient to preſerve their *Species* in a competent Number; hence it is, that they are wiſely ordain'd to *beget* and *bear* reciprocally. But it is worthy of Obſervation, that, tho' they have a Capacity of ingendering both Ways, it is at the ſame Inſtant both are executed, and not ſucceſſively or by Choice, as they are incapable of neglecting either to chuſe the other; ſuch is the Decree of Providence, that our *ſingle Natures*, and that of the Generality of Animals, are ſufficient to preſerve our reſpective Races in a ſucceſſive *Series*, and their *double Natures* can do no more; and this alone was the Purpoſe of ſuch Formations in all Animal Beings, and no other.

From the foregoing Obſervations it naturally follows, and muſt evidently be concluded, that Animals grow out of Animals, and Vegetables grow out of Vegetables; not by *Congeneration*, but by a true Succeſſion of one to another: The firſt of every Kind, in *both* Kingdoms, having been confined to a Capacity of producing thus, by its *Terminations*, ſucceſſive *Organizations* out of itſelf, as every ſucceeding one ſince is alſo. So that they ariſe from each other in a ſucceſſive Line, notwithſtanding their *Propagation* may be ſometimes retarded; in *Vegetables*, from their Seeds not being immediately ſow'd, or other Neglect of their Cultivation; in *Animals*, from Want of proper Opportunities and Occaſions for the Congreſs of Males and Females.

We are now come to ſhew by what *Means* Animals and Vegetables are propagated by their Parents; that is, how perfect Trees or Plants are cauſed to produce others of their Kind; and how perfect Animals are cauſed to produce their natural Offsprings.

Let us then again take a View of a Tree or Plant grown up ſo perfectly, as to begin putting forth its Parts for Fructification: Let us now obſerve the *Apices*, crowning the *Stamina*, loaden with the *Globules* of the *Farina*, the *pulpy Contents* of each *Globule* being the *Vehicle* to an exalted Fluid, which we ſhall here call the impregnating *Effluvium*; which *Globule* is deſtin'd to convey it from its native Place to one of the *Papillæ* of the Piſtil. Let us conſider the *Utriculus* now, and not before, fill'd with green, ſoft, and imperfect Seeds, juſt in a Condition to receive the Impregnation from the *Effluvium* of the *Globule* of the *Farina*; which, if they were at this Time more hard and perfect, they would be utterly incapable of, and come to nothing; containing their Fluids, which afterwards become a hard *Parenchyma* to each, and the little *Organizations* growing, as we have ſaid juſt now, and bearing but a ſmall Proportion of the whole Seed, and ſo blended and inveloped in theſe

Subſtances, as by no Means to be yet inveſtigated. This, perhaps, might have given Occaſion to that ingenious and indefatigable Obſerver Mr. *Turbervil Needham* to conclude that no *Germ* was ever to be found in the *Uterus*, till after the *Globule* had impregnated it, and to ſome others; from whence this Gentleman (to whom the World is much obliged for his Diſcovery of the * Action of theſe little Grains of the *Farina fœcundans*, and which has added great Strength to the Syſtem I am endeavouring to ſupport) thought that the pulpy Subſtance of the *Globule*, which I ſay contains the fœcundating *Effluvium*, produced the *Germ*, and that it was not in the *Ovum* or Seed. This would indeed ſeem plauſible, with Reſpect to the Analogy between Animals and Vegetables, if we could in any wiſe imagine the *ſpermatic Animals* were the *Origines* of the former; but, as we ſhall ſhew, hereafter, they cannot be ſo, we muſt take the Liberty of looking upon what theſe little *Grains* contain to be no other than a pulpy Subſtance, containing an *Aura* or *Effluvium* which conſiſts of ſuch Particles as are capable of *fertilizing* or fœcundating the little *Organizations*, now ſuſceptible of it, or, in other Words, of adding to the Organization its *vegetative Principle*.

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* Tho' *Monſ. Geoffroy* and others ſurmiſed long ago that the *Farina*, falling on the Heads of the Piſtils, diſſolves in the *Papillæ*, and that the ſubtileſt of its Parts only penetrates into the Tubes; yet Mr. *Needham* produced an Experiment which ſhews the true Action and Uſe of theſe *Globules*, by applying a Drop of Water to the *Farina* of Flowers upon the Object Glaſs of the Microſcope, which put them in Motion, ſwell'd them, and cauſed them to burſt, and eject a *pulpy Subſtance* to ſome Diſtance from them: See his *New Microſcopical Diſcoverries*, pag. 73, 74.

If we have an Eye to the Condition of the Seeds in the *Uterus*, at the very Time that the *Apices* of the ſame Flower are loaden with the *Farina*, it will be a Means of abſolutely ſhewing that the little Organization is not, nor cannot be tranſmitted from the *Farina* of theſe Male Parts, but is intrinſically in each *Seed* in the *Ute-*

rus, growing regularly and gradually, as well as every other Part, from the ſame general Organization; for, at this Time, all the Parts of the *Uterus* and *Seeds* are green and ſpungy; capable of being only *irrorated* or bedewed by a very ſubtile *Effluvium*, to which alone they are pervious; and not in the leaſt to a denſer Fluid, nor indeed to any Organization, tho' never ſo ſmall; having no Cavity that might in any wiſe receive any foreign Body; becauſe the native Organizations, together with all the Subſtances naturally belonging to them, are now, as a Maſs, fill'd with a green Juice, ready to be impregnated by the *Effluvia*, from the Matter of the Globules of *Farina*, every *Seed* being as it were in *Embrio* at this Time; and it is always a conſiderable Time after the *Farina* has done its Office, and the *Apices* have all fallen off, that every Seed comes to be diſcerned as a diſtinct Body, ſupported by its own Pedicle, and growing hard and compact in its Receptacle.

Let us again only conſider, that the whole *Uterus* at the Time of Impregnation

tion (in ſome Plants) is not within a hundredth Part as large as when the Seeds come to Perfection, and that their Growth afterwards is very great. We may truly affirm, that the *Poppy-Head*, which is a large Body, when fill'd with its Number of Seeds and dry, makes but a ſmall Show in the Center of the Flower, when it is ſurrounded by its *Stamina* and their *Apices*, which is the only Time of their Impregnation. Let us aſk whether ſuch Numbers of Seeds were adventitious from without, all ranged in their beautiful Order? Are the Seeds of Beans, Peaſe, and all other filiquoſe Plants adventitious Bodies to the *Uterus* of the Flower, or do not the Pods grow by their Pedicles from the Tree or Plant; and do not the Seeds in them grow from their Pedicles as well as the little Organizations in thoſe very Seeds, which actually grow and receive Nouriſhment from their Pedicles alſo? And, in a Word, is not this a more *certain* and *ſecure Method* of Propagation, than to commit theſe Things to the Chance of being formed, as ſeveral Authors would have the World believe; or, that the *Germ* ſhould be an adventitious Body, arriving at the *Ovarium*, when it is in no wiſe fit to receive ſuch a Body, nor any other Subſtance but an *Effluvium* capable of penetrating the whole Subſtance, and conſequently of meeting and impregnating the Organization now ready for it.

But the *Manner* of the Impregnation of the original Organization of either Animal or Vegetable, that is, how they are affected by the ſeveral *Effluvia* from the Male ſeminal Subſtances, muſt ever remain myſterious and unknown.

But, in order to illuſtrate theſe Things farther, it will not be diſagreeable to introduce, in this Place, an Account of the Means made Uſe of to propagate the *Dates* among the *Egyptians*, *Perſians*, *Arabians*, and other Eaſtern Nations *. Theſe are no leſs the ſtanding Food of a great Part of each of thoſe Nations, than *Corn* is of our Weſtern, or *Rice* of the more Eaſtern World; and therefore the greateſt Diligence they can be Maſters of, is highly neceſſary in their Care of the Trees which produce them, ſince their Neglect of them would end in no leſs than a Famine among the People. As therefore it is thus incumbent on them to procure their Year's Proviſion by their Care of theſe *Palm-Trees*, they plant them in great Numbers, and make them the chief Employ of the Huſbandman.

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* See *Kempfer's Amœnitatum exoticarum Faſciculus IV. Relatio IV.*

They are of that Claſs, whoſe Male and Female Flowers are in different Trees; therefore, they are obliged to place the *Males* ſo near the *Females*, as to render their Impregnation certain, by the Acceſs of the *Duſt*, or *Farina*, of the Male Flowers to thoſe of the Female; which, when duly ripe, are carried by the Winds to them; but ſometimes it happens, that the Male Trees will not grow in the ſame Soil with the Females, but are cultivated in very diſtant Grounds; and, therefore, the Inhabitants are obliged to carry the *Farina* from the Male Trees, either in Bunches as they grow, or upon dry Twigs prepared for that Purpoſe,

poſe, at the proper Seaſons, and place it in the *Capſula* among the Female Flowers, in order to their Impregnation; the Neglect of which would bring on great Diſtreſs.

Indeed, tho' the Flowers of moſt Plants are impregnated by the *Farina*, wafted by the Winds; yet, even where the Male Date-Trees are near enough to the Females, leſt contrary Winds or other Accidents ſhould be any Detriment to them, in their Seaſons, the People are ever careful enough to carry the *Farina* to the Females, in order to aſcertain a plentiful Crop, which otherwiſe might either totally, or, in a great Meaſure, fail by being left to themſelves *.

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* A Gentleman who was at *Batavia* informed me, that, ſome Time ago, ſome of the Chiefs there, obſerving, in a Grove of Trees, whoſe Male Flowers were upon ſome, and the Female Flowers upon others, that ſeveral of them never bore Fruit, order'd thoſe to be cut down as uſeleſs; the Conſequence of which was, that, after they were deſtroy'd, the

It is ſaid by the ſame Author, that the Sprigs of Male Flowers, when loaden with this *Farina*, are ſometimes ſold at a very dear Rate, and ſometimes very cheap, in their Markets, according as the Seaſon has been more or leſs favourable to the Trees.

The Analogy then will run thus: In *Vegetables* the *Male Parts* of the Flower muſt neceſſarily fœcundate the *Female Parts*, in order to propagate the ſucceſſive Tree or Plant; otherwiſe it is well known nothing is produced. So alſo, in *Animals*, the *Male* muſt neceſſarily fœcundate the *Female*, in order to propagate the ſucceſſive Animal, otherwiſe nothing is propagated. In *Vegetables* the *Farina* is carried to the *Piſtil* of the Flower lodged in the *Papillæ* leading to the *Uterus*, where the tender Seeds are

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the others never bore any more Fruit. Thus Ignorance produced the Loſs of their expected Crops from the Females, by extirpating the Males, which render'd them fruitful.

now ready to be affected; they paſs down the Tubes towards the Seeds, till the Narrowneſs of the Tubes hinders their Moving further; where they lie till the Acceſs of proper Moiſture cauſes them to burſt and eject, with ſome Force, their *fœcundating* Matter upon the *Ovarium*, and thereby qualify the *Seeds* or *Ova* to grow to further Perfection from its *Effluvium*. So, in Animals, the *Penis* of the *Male* conveys into the *Vagina* of the *Female* the *ſpermatic Matter*, which is a glutinous Fluid, and is the *Vehicle* to the ſubtile *Effluvium* which penetrates every Part, until it reaches and bedews ſuch *Ova* as are mature enough for *Fœcundation*, moſt commonly one, ſometimes two, and rarely more. After this is done, the groſs injected Matter is again rejected upon the firſt Turn or other Action of the Female; and, thus, as the ſeminal Matter in Animals muſt neceſſarily be injected by the Action of *Muſcles*, ſo the ſeminal Matter in Vegetables is injected by Means of a *ſpringy Texture* in each Grain of the *Farina*, to be put in Motion upon the firſt Acceſs of Moiſture, whereby the ſubtiler Part bedews the *Ovarium*, and fœcundates the Seeds.. In *Vegetables*, as ſoon as the Fœcundation is over,the Seeds ſoon grow to their full Perfection, all the Male Parts of the Flower dry and wither away, the *Uterus* becomes full of perfect Seeds, all lying in their proper *Niduſes*; and, when arrived to their full limited Size, growing hard; the Seeds at length drop from their Pedicles, and lie conceal'd in the different Places allotted them, in the Pod or Fruit; which Pod, upon due Maturity, drops too from its Place, and is then capable of anſwering all the Purpoſes for which it was intended, and for further Propagation in due Time. In Animals, ſoon after the Fœcundation is conſummated, the little *Ovum*, in the *viviparous* Kinds, grows turgid, breaks from its Hold, and is removed to the *Uterus* through the *Fallopian* Tube, where it receives proper Nouriſhment, till, growing ripe, it, in like Manner, at length drops off from its Place *, and is capable of anſwering all the Purpoſes, for which it was intended, and, for further Propagation in due Time; and, in the oviparous Kinds, the little *Ovum*, now fœcundated, ſoon acquires a hard Shell, no otherwiſe than a huſky Fruit, or Seed, is detached from its Pedicle, and is extruded to anſwer the natural Ends, and for further Propagation in due Time; and, that we may not forget any Part of our Analogy, we muſt obſerve further, that, after ſuch Fœcundation, as we have mentioned, is completed, the *Ova* of the oviparous Kinds of Animals, and the *Ova* or *Seeds* of Vegetables, have the ſame Neceſſity for a certain Portion of Heat to aſſiſt their Motion and Growth, without which they cannot be put in Motion, nor be capable of receiving Nouriſhment; nor conſequently can they grow, but muſt

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* As the *Fœtus* grows at the Extremity of the *Funis umbilicalis*, the *Placenta* is a Body which

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which is no leſs than a *Congeries* of vaſcular *Roots*, thro' which Nouriſhment is convey'd to it, which, when ſeparated from its Place of Adheſion, may be truly ſaid to drop from its Place, in the Manner of a Vegetable Fruit.

inevitably periſh; and, when an *Egg* is in a State of Incubation or other artificial Heat, in order to the Propagation of the Animal contained in it, the Motion is no ſooner begun by the Heat, in the Organization, than the nutritious Parts begin by Degrees to be convey'd to it by the umbilical Veſſels, and ſo continue, till the Whole is taken in by the Animal. The ſame is the Caſe in every Seed ſowed in the Ground; the finer nutritious Parts of the Seed are conveyed to the little Organization, till it has exhauſted them, whereby it becomes capable of farther Nouriſhment, as we ſhall explain it hereafter, when we come to ſpeak of the Analogy of the Fluids in Animals and Vegetables.

It may now be reaſonably expected, I ſhould give ſome ſort of Explanation of the Neceſſity, and Manner of the Falling off of the Bodies mentioned from their ſeveral Places; and in this there is an all-wiſe and powerful *Contriver* and *Ordainer* fairly pointed out, and the Neceſſity of a Succeſſion of Propagations clearly evinced.

Now, in order to explain this Matter, we cannot have a more proper Object in our View, than a Leaf of a Tree or Plant; it ſprouts out, and is propagated from an Organization peculiar to itſelf; it grows green and flouriſhes for Ornament and Uſe; and, when it has anſwer'd thoſe Ends, yields to its autumnal Decay; begins to wither, and, at length, falls off; for, when the Leaf has grown to its utmoſt Limit, having anſwer'd thoſe Ends mention'd, its Organization not being capable of growing any more, the Fibres which convey'd its Nouriſhment now begin to ſhrink; they can no more admit the nutritious Juices to paſs through them, they grow *criſp*, *hard*, and *dry*, and liable to be torn off from their Hold by the firſt Breeze of Wind. Nor can there be any other more natural Way of anſwering a Queſtion propoſed by a Gentleman of Penetration in Philoſophical Knowledge, which is, Why do not Animals and Vegetables grow on without End? Why do not Seeds, when they are perfectly form'd, grow on in their Pods, Huſks, or other Receptacles? Becauſe, ſays he, when a Body has once begun to grow, the ſame Propenſity for growing on ought ſtill to continue, and, the Particles of Matter increaſing too, it ought not to ceaſe.

But, as we have ſaid before, all Animals and Vegetables in the World have Bounds ſet to their Growth by the firſt Almighty *Fiat*, otherwiſe there could be no determinate Form preſerved in any Body whatſoever, beyond which they cannot go; for, in the Propagation and Growth of the Seeds now fixed to their Pedicles, by the Time the Pedicle of each has convey'd to its Seed as much of Nouriſhment, and of the fœcundating Fluid, as ſerves to render it *perfect*, the whole Cluſter of Seeds, as many as they may be, ceaſe to grow any more; for now, and not before, the *Organization* of every Seed is at its full Power of Diſtention, ſo far as is conſiſtent with its natural *Form*; it is here deny'd any further Progreſs, any more Nouriſhment becomes uſeleſs, and is refuſed; for the Veſſels of the Pedicle, which uſed to convey to each Part its peculiar Juices, become *rigid* and *wither* by Degrees; the Coverings of each Seed grow dry and hard, guarding the Parts from external Injuries; qualifying each to remain in that State, for many Years; until it has receiv'd an adventitious Nouriſhment in its natural *Matrix*, the *Earth*; and, at length, the very Huſks themſelves are in the ſame Manner depriv'd of any more Juices, and wither and dry: Juſt thus *Flowers*, *Fruits*, and *Leaves* muſt of Neceſſity drop off in due Time; and ſo muſt the Globules of the *Farina fæcundans*, as well as the *Ova* of every Animal upon the Face of the Earth, whether of Viviparous or Oviparous Kinds. This is farther mentioned in one of the ſucceeding Chapters. Moreover, if there was not this Reſtraint and *Limit* ſet to theſe Things, their beauteous natural *Forms* could never be preſerved, in Succeſſion to one another; for, if there was in Matter any *inherent Power* of Self-Formation, or if it had an unlimited Power of growing on without that univerſal *Divine Superintendency*, that every Thing in Nature preſents to our Eyes, it were much to be feared nothing would long continue conſtant to its own *Form*, and that many Parts of Nature would ſoon deviate from their true Standard.

All theſe Obſervations make it evident, beyond Contradiction, that a refined *Fluid*, from the ſeminal Matter of the *Male*, impregnates the *Organization* in the *Ovum* in the *Female* of every *Animal*; mingles with the *ſubtile* Fluids contain'd in it; and promotes its Growth and Progreſs; ſo in *Vegetables*, the refin'd Part of that *pulpy Fluid*, thrown out from the Globules of *Farina*, alſo mixes with the *Juices* of, and impregnates the little Organization in, the Seed of every Plant. Now by this Admixtion and Combination of theſe refined Fluids *, which we have often call'd an *Effluvium* in the Male Parts, there is an immediate Alteration produced that was not exiſtent in the *Ovum* or *Seed* before; for the innate Juices of the Organization has Qualities peculiar to itſelf, as to *Colour*, *Taſte*, *Smell*, *&c.* be its Quantity never ſo ſmall; ſo no one can in the leaſt doubt, but the impregnating *Effluvium* of the *Male Parts* of Animals and Vegetables has its own peculiar Qualities, as to *Colour*, *Taſte*, *Smell*, *&c.* Now, therefore, it can be no difficult Matter to conceive how the Congreſs of a *Black Man* with a *White Woman*, or *vice verſa*, ſhould propagate a *Proles* of a Colour between both; the common Experiment of mixing what we call a Fleſh-Colour and Black, in certain Proportions, will produce a *Tawny*, and in a great Meaſure alſo influence its Form, as it grows. And thus in Vegetables, if the *Farina* of one Species of Plant or Tree ſhould reach the Flower of another, and fœcundate the *Ovarium*, the Colour of the future Flower and Fruit would be variegated, and the Form of the Fruit a great deal influenced too.

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* Our Notions of the Manner of Propagation are abſurdly groſs if we fancy an Admixtion of groſs ſeminal Matter for the Purpoſe; theſe *Phænomena* are carried on from extreme minute Beginnings; minute beyond our Power of Viſion, and yet as perfect and ſecurely defended, nay, more ſo than larger Bodies, tho' Millions of both Animals and Vegetables muſt remain not only beyond the Power of Viſion, but even our Conception.

It is impoſſible to omit making an Obſervation in this Place of the Benignity of the DIVINE BEING; in this very

Matter he ſeems to have done every Thing that might favour the Propagation of the *Human Race*; for, tho' ſuch different *Species* of Men and Women ſometimes meet, and copulate, there is ſuch an Agreement between the *refined* Parts of the ſeminal Matter of the Male and the *innate Juices* of the Organization of the Female, that there is nothing in their Commixtion which can prevent the *Proles* from being capable of further Propagation, with any other different *Species* of the Human Race. Whereas when different *Species* of other Animals copulate, for Example, a *Male Aſs* and a *Mare*, their *Proles* cannot produce another *Proles* of any Kind *. This *Phænomenon* has not been hitherto accounted for, that I know of; but, I ſhall attempt to account for it by offering Reaſons, as follows: The impregnating *Effluvia* in the ſeminal Matter of the *Mule* are ſo much degenerated, by the former unnatural Mixtures of the Parents, from any *Homogeneity* with the Particles of the innate Juices of the Organization in the *Ovum* of its Female, or any other whatſoever, that, inſtead of that *Agreement* that naturally happens in the Fœcundation upon the Coit of *homogeneous* Animals, the Acceſs of thoſe *Effluvia*, in ſuch as are *heterogeneous*, either utterly deſtroys the Organization, or they have not the proper *Qualities* for promoting any farther Propagation, and ſo leave the *Ova* unimpregnated, and conſequently incapable of ever coming to any Thing.

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* Even tho' it is affirmed that the Male and Female *Mules* are as ſalacious and eager for the Coit as the moſt natural Animals; in like Manner ſuch Fruits or Seeds as may be the product of a preternatural Coit, would alſo be incapable of producing a Succeſſion of others like themſelves; the Number of the Species of Plants was limited at the Creation, as well as that of Animals; and the

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the ſame Diſagreement of the impregnating *Effluvium* of the Globule of *Farina* would happen, by any accidental Excurſions from their own natural Courſe with the Juices of a different Organization, and their ſucceſſive Powers and Qualities would inevitably be deſtroyed.

From theſe Conſiderations it plainly appears, that the Deſign of Providence was to imprint ſuch reſtrictive Laws upon thoſe Parts of Nature, that are to be propagated in Succeſſion to each other, as are ſufficient to render them all beautiful; to preſerve their natural Forms; to prevent and hinder the Propagation of a Race of Monſters * upon the Earth, in thus altering the Nature of the *Effluvia* mention'd, by a preternatural Coit of Animals; and very effectually and particularly to favour the Propagation of the Human Race, let the People, which come together, be never ſo different in their Perſons; all which will gradually grow more evident in the Sequel of this little Work.

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* If it was not ſo, we ſhould by Degrees ſee a new Set of heterogeneous Animals and Vegetables ariſe upon the Earth; but it is plain it never was the Deſign of the Almighty, ſince every Species of Animals and Vegetables are the ſame now that they ever were, nor muſt we expect any others, while Time ſubſiſts. See my *Mechanical and Critical Enquiry into the Nature of Hermaphrodites*, Chap. 1. p. 7.

Now, ſince this is evidently the Caſe of Propagation in the *larger* Animals and Vegetables, who can in the leaſt doubt that the ſame Scheme is the Support of the *minuteſt*? It is the moſt ſimple and intelligible Syſtem, nor is it at all likely that there was any Neceſſity for a new Method of propagating them; ſince all thoſe which we are able to diſcern with our naked Eyes, from the Whale and Elephant to the reptile Inſect, and from the moſt lofty Pine and ſpreading Oak to the little creeping Plant, are abſolutely propagated, through every Claſs of both theſe Worlds, exactly in the ſame Way.

Minute Animals exiſt every-where, as well as little Plants inviſible to the naked Eye, whereſoever there is a proper Element to ſuit their Natures. Innumerable Kinds perhaps yet undiſcovered enjoy Life in Places where neither Rays of Light, nor a current Atmoſphere, can ever reach them; and we know that minute Animals in Water will be as ſeemingly well, when corked up cloſe, ſo that no Manner of Air can circulate to nor from them, which I have often experienced, as if the Bottle was left open. Their Neſts are in every Fluid and Solid of Animals and Vegetables, or any other Kind; and ſeveral are brought to View, when the Liquors that contain them are tranſparent enough to let them be ſeen. And, it is well known to myſelf and others, that the Action of boiling * Water, and other violent Heats, upon ſome Microſcopical Animals has no Power to in-

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* Doctor *Hill* communicated the following Experiment to me: A Phial was kept in Water boiling on the Fire; ſome Seeds of Henbane were bruiſed thoroughly in a Mortar; the Phial was taken out nearly fill'd with the boiling Water, and the bruiſed Seeds immediately put in; after thoroughly ſhaking up the Phial with the bruiſed Seeds, more boiling Water was poured in till the Phial was fill'd up; it was then corked up and ſealed down. After three Days it was opened, and a Drop of the Liquor, examined by the Microſcope, was found ſo full of Animalcules, that there ſeemed ſcarce Room for them to move. They were of the flat Kind often found in the Infuſions of Plants, and in common Water alone, after long Standing.

jure them. Nor can I conceive it any greater Wonder that we ſee minute Animals, as well as Plants, propagated in one Place more than another, or in one Fluid more than another; they have all their proper native Places allotted them, as well as any other Inhabitants of the Earth or Waters, however great or ſmall they may be. There is no Subſtance whatſoever that is not full of Life. The Maſs of Blood and all the Juices of every Animal ſwarm with Animalcules; but it is only ſuch Fluids as are perfectly tranſparent, that admit their being ſeen by the Microſcope. Now, Putrifaction and Fermentation being Means by which Fluids are clarified and become tranſparent, the Animalcules inhabiting them are brought to View, when that is done; and, this being the Caſe, 'tis not ſtrange that ingenious Men may be led to think that Putrifaction or the Decompoſition of Subſtances qualifies them to generate new Creatures in the minute Syſtem of the Animals of the World. If ſpermatic Animals are ſeen in their natural Fluid, it is only becauſe that Fluid is concocted and prepared, and conſequently tranſparent; nor is it any

Matter, by what Means Fluids become tranſparent, provided they contain nothing that is diſagreeable or pernicious * to theſe little Creatures; they will be brought to Light, but not newly generated.

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* A Solution of any fix'd Salt in Water, and a Drop put into the Water wherein Animalcules are in great Quantities, deſtroys them all inſtantly.

CHAP. III.

Of three Kinds of Organizations which ſerve to the Propagation and other Advantages of Animals and Vegetables, viz. *the* primary, *the* ſecondary, *and the* ſubordinate *Organizations.*

IN viewing the Works * of the Creation, there is no loſing Sight of the moſt evident Marks of the Care taken by the Divine CREATOR, for the Preſervation of every Individual he has made;

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* It is well worth While, and of the greateſt Conſequence, to conſider that not only the moſt regular Order, but alſo the moſt convenient and neceſſary Contrivance, in every indiviſible Part of the Creation, is manifeſt to the meaneſt Capacity; and hence it muſt be concluded, that the Almighty Power of an infinitely wiſe BEING was the Conductor of all Things; and it muſt be allow'd that all material Things are *naturally* more ſubject to Irregularity and Confuſion, than

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than to any Manner of Symmetry and Order; is it not therefore ſtrange we ſhould not ſee any Confuſion at all in Nature? That nothing prepoſterous or erroneous, in the ſeveral Syſtems of the World, ſhould ever happen; but that they ſhould conſtantly proceed in the moſt regular Order, if Things are diſpoſed either by Chance, or any ſecondary or inferior Agent?

Every Object the Univerſe contains neceſſarily implies two Things: Firſt, a previous Confuſion in the Materials that are its conſtituent Parts; and, ſecondly, an omnipotent Diſpoſer of them into the Forms and Order we ſee them in; or, they muſt ſtill have been in that confuſed State; nor is it poſſible to imagine that Things ſhould have been ranged as we behold them without Beginning, any more than it can be ſuppoſed that *Gold* or other Metals are the ſame in a well formed *Cup*, as they were, before the Workman's Hand had ſeparated them from their Droſs and Dirt in the Ore, and work'd them up into the beautifully-faſhion'd Utenſil. *All Things declare the Glory of God and his Handy-work.*

and, where any Part may have a ſeeming Diſadvantage in its Structure, many convenient Circumſtances may be obſerved to attend, and make ample Amends for it. Or, wherever it is neceſſary that Things, whoſe Uſe there may be greater Need of than ordinary in the World, ſhould be preſerved, or, more particularly, propagated, we may plainly ſee divers Ways, for its Preſervation or Propagation, pointed out in its own Compoſition.

Theſe Marks * of the Beneficence of the

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* Every Thing is render'd convenient to the Inhabitants of the Earth; thoſe moſt diſtant from the Sun, if they feel not the ſcorching Heat of his Rays, as do the hotter Climes, yet have a ſufficient Portion of Warmth, favoured by many other Circumſtances, to afford ſuch Productions, in Plenty, as are capable of rendering Life happy and pleaſant, in all the Neceſſaries wanting; and this is really the Caſe in every Part of the Earth. And tho' the Inhabitants of ſome Parts of the World may be thought miſerable, in all Reſpects, by the Luxurious of other

the *Divine BEING* are very apparent, as we have before obſerv'd, not only in the Animal, but alſo in the Vegetable Creation, eſpecially in ſuch Parts of it as are immediately neceſſary for the Food or other Wants of Mankind; and, however inattentive too many of us may be to theſe Kinds of Subjects, I cannot but think, that Conſiderations of this Kind are moſt worthy the ſtudious Hours of

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ther Places; yet we have innumerable Inſtances where ſuch *reputed* Wretches have never been really unhappy, till they were deprived of their native Abodes, and uſual Manner of Life; raſhly miſtaken for Scenes of Diſtreſs and Woe. Surely theſe Things could never have fallen out ſo well by Chance, but are undeniably thus influenced and guided by their great CREATOR, who alone knew beſt how to render every Part of the Earth agreeable, and convenient, to its own Inhabitants, whether cold or hot, whether Iſland or Continent. Nor do we find the People of any other Spot of the World more, nay, not ſo, liable to Calamities of every Kind, as thoſe Nations who too fondly believe, they ſeverally poſſeſs the only Paradiſe of the Earth themſelves.

the Learned, and moſt conducive to ſhew us that the Gratitude they claim ought more frequently to fill our Contemplations. The following Obſervations will confirm even more than I can ſay on this Head; and, I hope, give more Encouragement to Reſearches of this Nature among us.

If we carefully conſider this very great Analogy * between the Manner of the Propagation

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* Since it has pleaſed the ALMIGHTY to limit our Senſes and Underſtanding to certain Bounds, beyond which we cannot ſee nor comprehend, even with all the Helps Mankind is capable of inventing; it muſt be acknowledged a ſuperlative Bleſſing that he has been pleaſed to give us a Power of diſcerning this *Analogy* and Uniformity in his Works; as if it was his Will, that ſo ſtrong a Teſtimony of his Superintendency over all Things ſhould always confront thoſe *Enemies* to Truth, who graſp at every Occaſion to ſow the Seeds of Confuſion among weak Minds; and willingly paſs by ſuch plain and ſimple Manifeſtations of theſe Truths, as this great Analogy happily affords us.

pagation of Animals and that of Vegetables, ſhould we not treat the two Subjects alike, as there really appears no capital Difference between them? Does not the *Ovum* of the Animal contain a *Congeries* of Veſſels, or perfect *Organization*, whoſe timely Explication and Dilatation muſt of Neceſſity produce ſuch or ſuch an Animal, by the Acceſs of proper Nutrition, and in a natural *Matrix?* And, what in like Manner, is the *Seed* of any Tree or Plant, but an *Ovum*, containing the *Rudiments* of its future Tree or Plant, like its Parent, a perfect *Organization*, capable, in like Manner, of Explication and Dilatation, into the ſame Species, *only*, of Tree or Plant, by proper Nouriſhment and in a natural *Matrix?* And as, in the firſt Explication of the Organizations of Animals, one Part may be extruded a little before another, ſo as to ſeem even prepoſterous; ſo in Vegetables, too, how different are the firſt Shoots from the Perfection of the natural Form which appears afterwards in due Time? And, as every Seed or *Ovum* differs in its natu-

Species; but that every Seed muſt of Neceſſity produce a Plant like its Parent; for Na-

ture

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changed into different Kinds of *Vetches*, and that the *Melampyrum*, or Cow Wheat, is alſo often produced by the Change or Degeneracy of Wheat.

Had this good old Man but conſidered how abundant theſe Weeds are in all Places, he would ſurely have thought it as neceſſary to pick and chuſe the *Mould* or *Earth*, in which he ſow'd the Corn, as the Corn itſelf; for theſe Plants conſtantly bring to Perfection, and ſow their own Seeds in great Abundance; and, let Gardeners bring their Mould from whatſoever Place they will, they cannot avoid bringing with it the Seeds of thoſe Weeds which were its Inhabitants before.

Seeds will lie in the Ground a long Time without Growing, and we find that thoſe of the annual Plants always lie from the Time of their being ſcattered in the Ground, until the Sun's Approach in the following Spring, or other natural Cauſes, encourage their Growth, at the uſual Time; and if ſmall Seeds are put deep into the Ground, and

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ture has never ceaſed to be obſervant to the Laws, at firſt, laid down by its Divine Author.

Now

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the Earth preſſed down cloſe upon them, ſo as that the Air can have no Communication with them, they will lie there without Growing ſeveral Years; and, at length, being freed from the Preſſure, by the Turning up of the Earth, ſo as to lie unconfined, they will receive proper Nouriſhment and grow; this ſhews the Uſefulneſs of the *Harrow* and the *Rake* in the ruſtic Buſineſs; which are Inſtruments to break up and looſe the Mould, whereby the *ſaline* and other Particles of the Earth the more eaſily receive and mix with thoſe of the *Air*, in order to conſtitute the natural Nouriſhment for the Growth and Increaſe of the Seeds.

But, beſides this Preſſure and Hardneſs of the Ground, which thus ſometimes prevents the Growth of Vegetables, by denying them the free Acceſs of the combined Nutrition of the Air and Earth, there is, in ſome Seaſons, ſuch a Conſtitution of the Air, as retards the Growth of Vegetables for a whole Seaſon, and ſometimes longer; notwithſtanding all the Care of the Huſband-

Now ſince Animals and Vegetables are thus firſt propagated from Eggs, each con-

taining

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man in Tilling, and other Management of the Ground, to the beſt of his Power.

Thus it happened once to a Farmer who had ſown a Field with one Sort of Grain, in his uſual Method, none of which came up at the expected Time. This made him prepare the Ground for another Sort, which was accordingly ſowed in due Time for the next Seaſon. Early in the Spring, the former, which had, as is obſerv'd, lain in the Ground without any Change, till now, grew up and flouriſhed in ſuch Plenty, as to impede the Growth of the greateſt Part of the latter, and predominate; which (as the Farmer had before imputed the Failure of the latter to the Badneſs of the Seed) cauſed an erroneous Report to prevail among the Neighbouring People, that the one had, for the moſt Part, changed into the other Sort of Grain. Thus are Errors propagated by falſe Appearances; and ſuch is the Propenſity in ſome Men for believing marvellous Things, that they are ſorry to be undeceiv'd, when the admired Prodigy ceaſes.

The

taining a perfect Organization of its own Species, we will call this a *primary Organization*;

The ingenious Doctor *John Martyn*, whoſe *Tranſlation of Virgil's Georgics* will ever do him Honour, takes Care, in his Note upon the 154th Line of the firſt *Georgic*, to remove the Doubts that may have led Readers to imagine, that Corn degenerates into other Species of Plants: He is particular in telling how very common *Darnel* and *wild Oats* are in Corn Fields, and deſcribes the latter; and takes Notice, that it was a common Opinion among the Ancients, that Wheat and Barley degenerated into theſe Weeds: But, ſays he, they are ſpecifically different, and riſe from their own Seeds. In the 198th Line of the ſame *Georgic*, *Virgil*, ſpeaking of the Care neceſſary to be taken in preparing the Seeds before they ſow them, ſays:

Vidi lecta diu, & multo ſpectata labore
Degenerare tamen; ni vis humana quotannis
Maxima quæque manu legeret.

To *degenerate* here ſignifies no more than to become leſs, or more ſtarved, without changing in the leaſt any Part of its own Structure; nor is it underſtood any otherwiſe by *Columella* who quotes theſe Words of *Virgil*, whom he very often follows throughout his Work.

nization; to which will naturally *ſucceed* two others, namely, a *ſecondary Organization*, and a *ſubordinate Organization.* The ſecondary Organization is placed in other Parts * of the Plant or Animal, and is capable

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* This is an Implication or Folding up of Part of the Fibres of the firſt, or any other, Shoot in Tree or Plant, ſo as to form a Knot; I have now by me ſuch a Knot, which was taken from the *Ala* of the Bough of an Oak, which had lain long dry, and reſembles the Implication of the Fibres of a Human Heart. It is obſervable that to every ſuch Organization, whether of Tree, Shrub, or Plant, there is always a Paſſage from the *Medulla* or Pith, which communicates with it; and this is of great Conſequence in conſidering the Manner of its Accretion and Dependence upon the medullary Subſtance.

Every *Surculus*, Branch, and Leaf has its peculiar Organization, whence it is puſhed forth in due Time; and it is eaſily viſible by an expert Diſſector of Trees and Plants, in the larger, by the naked Eye; in the ſmaller by the Microſcope; and affords a very pleaſing capable of producing its *Species*, as well as the firſt or primary Organization; and,

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ſing Entertainment, each being no more than an Elongation of the Original Fibres of Tree or Plant. I have made it my chief Study for a long Time to obſerve theſe Things, led on to it by the learned and induſtrious *Malpighius*, whom I have ever found conſtant to Truth in all his Obſervations. This Implication or ſecondary Organization, beſides being capable of becoming, by its Growth, Boughs and Branches or a perfect Tree or Plant, anſwers one very great End, which is: That the Boughs or Branches, in Proportion to the Stock that bears them, in either, would be too ponderous, and tear away from their Trunks, if theſe Boughs conſiſted only of the ſubdivided Fibres of the Trunks; whereas the knotty Implications, which produce theſe Boughs, having Communication with the Trunks that riſe beyond and from them, as well as with thoſe from whence they grow, they are thereby ſtay'd and ſupported ſufficiently, not only to be made very firm in their Places, and capable to ſuſtain their Weight, but alſo to reſiſt and bid Defiance to the 'rankeſt Storms; who can look on a ſaw'd and the ſubordinate are ſuch Organizations as are placed in certain Parts, to ſerve

occa-

Plank or Board of any kind of Wood, and not obſerve all theſe Things? Every Knot in a Board is ſuch an Organization as we have been ſpeaking of; and every one of them was capable of producing new Boughs and new Implications, or Nodes, ſtill capable of producing others in their Growth. And altho', in Woods that are very hard, the Foldings of theſe Organizations may be difficult to obſerve; yet, in the more ſoft Vegetable Bodies, they are eaſily traced by macerating them in Water, properly managed, for a conſiderable Time. *Malpighius* having made the moſt accurate Obſervations upon the Syſtems and Growth of Plants, eſpecially where he treats of the Increaſe of the Stalks or Trunks of Vegetables, concludes that Section in the following Words: “ *Nodus eſt productio recentis ſobolis in fibris ligneis et tracheis, ut exteriùs derivata in nova folia, et plantulæ ſurculum, ſcil. gemmam, compingatur. Et quoniam fortis exigebatur alimenti miſcella, et caulis robur, ideo exarata fibrarum implicatio neceſſaria fuit. Interiores fibrarum faſciculi cum exterioribus communicant, et a ſingulo faſciculo multiplices promuntur fiſtulæ; quare aliæ ſur-*

“ *ſum,*

occaſionally for the Uſe of the Animal who poſſeſſes them; which will appear very clearly hereafter.

In the larger Animals one compleat Organization * is ſufficient to perfect the Whole;

" *ſum, aliæ in folia, reliquæ in gemmam de-* " *ſinunt. In arboribus ubi rami producuntur,* " *reticulares quoque propagines a quolibet ligneo* " *involucro promuntur, quæ unitæ cylindrum* " *efformant, ramum ſcil. conſimilem trunco; unde* " *in utriſque a natura delati alimenti rudis miſ-* " *cella promovetur*".

* It is ſomewhat neceſſary to explain what a compleat Organization is, in this Place, both in Animals and Vegetables. It conſiſts of one intire *Syſtem* of *Veſſels* ariſing from and arriving at the Heart again; the Arteries, going from their Source to their Extremities, are ſettled into the various Parts, by the Diſtribution and Ordination of their Contexture and Implications; and ſo are the Veins; the Extremities of the Veins, which ariſe from thoſe of the Arteries, going back to carry the Blood to the Heart again; an Animal therefore may be defined a *Congeries of Veſſels,*

Whole; for Animal Subſtances are naturally emollient and flexile, and conſequently

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Veſſels, ſome of which are terminated into Bones; ſome into Membranes; ſome into Cartilages; ſome into the *Viſcera*; ſome into Skin; and ſo on to form every Part of the Body. We are alſo to conſider it, while compleat and intire, to be capable of all its neceſſary Functions allotted it in this Life; however, that the Diviſion of one or more Parts cannot always deſtroy it, but that the Diviſion of its principal Parts utterly deſtroys it. This is certainly the Caſe in Animal Bodies.

Now the ſame may be ſaid of Vegetable Bodies alſo with Reſpect to their Parts; the intire Tree or Plant is no leſs than a *Congeries of Veſſels*, which the Microſcope makes evident to every Obſerver; ſome of which, according to their peculiar Manner of Growth, are ordain'd to ſettle into different Organizations, from which all the Parts of the Tree or Plant are produced; ſome paſſing ſtraight on, and ſome terminating in little Nodules or new Organizations, which anſwer all the Purpoſes for which they were deſtined in due Time; or, in other Words, produce new Boughs, Branches, ſequently capable of Explication and Dilatation from its Beginning to the perfect State

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Branches, Fruits, *&c.* according their deſtined Purpoſes.

The Roots of Trees, as they ſpread thro' the Ground, ſend up Twigs, which are generally ſtraight; we have innumerable Inſtances in our Cane-ſhops of fine ſtrait *Oaks* and *Hazles*, which all grow thus from Organizations placed in the Roots, by the Terminations of ſome of their Fibres; ſo that there might be many Trees produced from the ſame Parent, by ſlipping them off and planting them; as well as from the Seeds themſelves, and much ſooner. This is the Reaſon why Trees or Plants, turn'd upſide down in the Earth, will grow upwards with natural Boughs, Branches, *&c.*

In the *Proemium* to *Boerhaave*'s Hiſtory of the Plants of the *Leyden* Garden, it is ſaid, there is no Difference between the Roots and Branches of Trees, except that the former are in the Earth, and the latter in the Air; and that therefore, if theſe Plants were inverted, their Roots would in like Manner produce Leaves, Flowers, and Fruits, as the

State of the Animal, for Reaſons given hereafter, without any Neceſſity for a
ſecondary

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the Branches uſed to do. But we muſt beg Leave to ſay, it is evident that many Trees and and Plants differ very much in this Reſpect, ſome having fibrous ſlender Roots, whilſt the Trunk and Branches are ample, ſtrong, and thick; and, on the other Hand, ſome having thick Roots, whilſt the Plant itſelf is ſlender and weak; but if the Tree or Plant be inverted, and nutritious Juices be abſorbed by the Parts put into the Ground, I grant that the Nouriſhment will be carried to the Roots upwards, and there will be produced Boughs, Leaves, Flowers, and Fruits in due Time: Not, however, that theſe viſible Roots now in the Air are changed into Boughs, &c. but that the Organizations, placed here and there in them, will produce Branches, Leaves, Flowers, and Fruits, as the Organizations of the former Branches did, while in the Air; not at all differing from them, but keeping conſtantly to their own ſpecific Nature and Form.

But we will mention a few among the Plants, in which this Doctrine of *Boerhaave* cannot hold, ſo as to make any Compariſon
of

ſecondary Organization; but in Vegetables there is Need of divers ſecondary Organizations,

of the Roots and Branches; can it be imagined that the *Carrot*, *Parſnip*, *Turnip*, *Liquorice*, and Numbers of others, are ever capable, in themſelves, of being like their Stalks, Leaves, and Flowers, by any Management whatſoever? It was never deſigned by Providence, in the proviſional Care for Mankind, that they ſhould be ſubject to any Manner of Change; ſince the grand End is anſwer'd, in the Nature and Structure of theſe Roots, when they become fit for Food; and this is all that appears neceſſary in the Œconomy of theſe *eſculent* Plants; look alſo on all the Pulſe Kinds in general, and the ſame great Difference will appear between the Roots and Branches; and, if we examine the whole Claſs of Trees, the Roots of the greateſt Number by far will be found to bear no Manner of Reſemblance to the other Parts of the Tree.

Again, if the Branches were buried in the Earth, and the Roots expoſed to the Air never ſo long, it is impoſſible to imagine their *Colour* and *Conſiſtence* would be alike in every Reſpect; for, in ſome of them, the

Roots

tions, whoſe Fibres are more rigid, and of a harder Nature, and therefore inca-

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Roots have one *Taſte* and *Quality*; the reſt of the Tree another; and ſo of the Plants we have mentioned; but of this we ſhall ſpeak further in the next Chapter, where we ſhall give Reaſons for this Opinion.

And further, as Nature never intended Leaves ſhould grow under Ground upon the Roots, ſo the peculiar little Organizations which produce Leaves are only to be found on the Trunks and Branches of Trees and Plants; but the Organizations capable of producing the intire Tree or Plant are providentially placed in the Roots of Numbers, as well as elſewhere.

The beauteous Leaves, Bloſſoms, Flowers, and Fruits are ever Ornaments deſigned to bleſs the Sight and gratify the Organs of Smell; by the Conveyance of their ſweet *Effluvia*, wafted by the Winds, capable only of inhabiting the open Air; hence, beyond Contradiction, whatever Branches, *&c.* appear above Ground, from ſuch an Inverſion of Trees or Plants, muſt grow only from the *ſecondary* Organizations placed in their Roots.

pable of being explicated to ſo great a Degree of Extenſion, as many Trees and Plants acquire.

In all Trees or Plants the primary Organization being, as we have before obſerved, in the Seed or *Ovum*, the firſt Explication is compleated in the firſt Shoot; becauſe, when this is done, then the ſecondary Organization, which conſiſts of the Rudiments of the firſt Ramification, depoſited and growing at the End of this Shoot in the moſt convenient Place, has Room for its Explication. And, when each Ramification is explicated to its proper Length, it may to the ſucceeding ones it contains, in like M anner, b accounted another Shoot; and ſo on to the Extremities of every Ramification, as long as the Tree or Plant can grow. Hence every Branch coming out of another, proceeds from a perfect Organization, depoſited at the upper End of the firſt, where it occaſionally appears; and hence every Branch is capable of growing into a perfect Tree or Plant, like the Parent of the *Ovum*, which produced it firſt; ſo that, to ſum it up, the firſt Shoot of Tree or Plant grows on to form the *Trunk*,

Trunk, ſending off other Ramifications from its Organizations, as it riſes; whilſt each Ramification goes to form a *Limb* or *Arm*, as it ſpreads; ſending off other Ramifications from its Organizations, and ſo on to the utmoſt Extremity and Growth.

And when we ſee ſome Species of Trees or Plants riſe very high * and ſlender, without Leaf or Branch, it can be ſo, only becauſe no Part of them have ſuch ſecondary Organizations, in the Way to produce them; ſo that the *Ala* of every Leaf contains an Organization too, from whence a Tree or Plant may be propagated, which daily Experience will ſhew. Every one who is converſant in Country Affairs, knows that to cut an *Ozier* in Pieces, * and plant them, they will produce Trees; and ſo will Cuts of *Gooſeberry* * and *Currant-Trees*, and I am now pretty ſure tender Cuts of any others will do the ſame. I have tried ſeveral at different Times, which I cut and planted, taking an Account of the Number of theſe Organizations in each Piece, and always found that the Sproutings were from theſe Organizations; and, on the other Hand, have often experienced that no Piece without an Organization ever grew, but rotted away. I have planted Cuttings and Slips of various Plants, and, from many repeated Obſervations and Experiments, found that no Part produced a *Bud* or *Germ* but theſe Organizations.

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* The *Areca Tree* or *Arbor Fauſel* riſes to a conſiderable Heighth, before its Branches ſpread from it, for this and no other Reaſon. Many Plants of the *Aſh* have long Interſtices without Leaf or Branch, between theſe Organizations, which, to their utmoſt Growth, can never puſh forth either for Want of them, no more than the Interſtices between the Joints of all the Kinds of *Cane*; and, in a Word, whatſoever ſmooth Parts there are in any Kind of Tree or Plant the World produces, they are only ſo becauſe there are no Organizations to produce Branches, Leaves *&c.* as we have ſaid above.

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* When a Slice of an *Ozier* is growing, the End, which is in the Ground, after the Organization has ſhot out, and has emitted its Roots, rots away and moulders, leaving not the ſmalleſt Veſtige to be perceiv'd adhering to the now entire Willow Plant; and the upper End alſo moulders off, leaving a kind of *cicatrix*, which in Time is totally obliterated. And, if there be more Organizations than one in the Piece that is planted, the loweſt, which is in the Ground, always ſhoots out the Roots as well as Branches, and the others, as many as they may be, become only Ramifications, receiving their Nouriſhment from the Trunk, between the loweſt and uppermoſt Organizations; ſo that no more of the Piece periſhes but the two Extremities, that is, what is beyond either of the extreme Organizations; and this is the Caſe with all other Cuttings of Trees or Plants.

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* The ſtraight white Shoots which generally grow up from the *Gooſeberry* and *Currant-Tree* are the fitteſt Cuttings for Growth; for the Trees that grow from them are largeſt and bear the fineſt Fruit; altho' Cuttings of any other Parts of the Trees will grow and bear Fruit, having a ſufficient Number of Organizations for that Purpoſe; but they will be more dwarfiſh and craggy, and the Fruit will be ſmaller in general; nevertheleſs, in both theſe Caſes, they can never degenerate from their own *Natures*, *Qualities*, nor *Forms*.

Let us again carry theſe Obſervations a little further, and we ſhall find theſe Organizations placed alſo in Roots of various Kinds, of which the following Examples will become ſufficient Teſtimonies. The ſeveral beauteous Flowers raiſed annually from *Roots* and * *Layers* evince the ſame Thing; and, if we only obſerve the Manner of propagating that moſt uſeful Root the *Potatoe*, we ſhall ſee one of the

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* There are three manifeſt Ways by which Flowers are propagated; firſt, by the *Seed*, but this s the moſt tedious Way; as, many Plants rais'd from them will not flower the firſt Year, and ſome not the ſecond. The ſecond Way is from *Roots*, which is a better and more ſpeedy Method of producing them; and the third is from what Gardeners call *Layers*, which is generally done thus: When the Stalks of Plants, which are deſigned to produce Flowers, riſe pretty high, they are furniſh'd with ſeveral Organizations or Nodules; the *Gardener* begins at one of the loweſt of theſe that is above Ground; and carrying a Cut of his Knife, from thence upwards,

ſtrongeſt

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wards, ſplits it as far as the next Organization above it; and then, with a hooked Stick properly apply'd, forces the cut Part into the Ground, and ſo on with as many as he pleaſes all round the Roots. Theſe Organizations become Roots, and carry up more immediate Nutrition, in greater Quantity, for the Reaſons given in the next Chapter, to the upper Parts of the Stalks; and thereby propagate Flowers larger and finer than by any other Means; and whereas each Stalk, if not laid, would produce fewer, by being laid it produces one at every Organization. Thus in Fruits and Flowers the greater the Quantity of the natural Juices, and the more ſpeedily convey'd to them, the greater Number of the latent Organizations will be propagated, and the nobler they will appear for Uſe. This is one of the numberleſs wiſe Leſſons pointed at by the AUTHOR of Providence, that he has been pleaſed to render theſe Things capable of Improvement, and hence, that the Induſtrious ſhall be well rewarded for his Labour and Pains. *Virgil*, in his ſe-

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ſtrongeſt Inſtances of this wiſe Contrivance; the Farmer cuts thoſe Roots each into ſeveral Pieces, and plants theſe Pieces;

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cond *Georgic*, Line 73, gives to theſe Organizations or Buds the Name *Eyes :*

> " *Nec modus inſerere atque oculos imponere*
> " *ſimplex.*"

Theſe Eyes in Potatoes are ever ſituated upon the Surface of the *Parenchyma*, where the *Cortex* ſinks in, and are form'd like hollow *Cones*, tho' very ſmall. We cannot but admire at the great Goodneſs of the CREATOR in the Diſpoſal of theſe Things; that in Roots of this Kind, which are to be Part of the Food of Mankind, thoſe Organizations are generally ſituated on the Surface of the eſculent Part, or ſomewhere at the Extremity, if they are different in Subſtance in any wiſe from it, that they may not interfere with the Part we are to feed on, but be peel'd off with the Skin, and thrown away; but in the Pulſe Kinds, their little Organizations being as eſculent and nutritious as the other Parts, there was no Need of ſuch Precaution, nor was it neceſſary in *Gooſeberries*, *Currants*, *Mulberries*, *Raſpberries*, and ſuch like; whoſe little Seeds can do no manner of

Pieces; and is ſure to have from each Piece a Plant or more ariſe out of the Ground, emitting fibrous Roots, which at length produce them in great Perfection and Plenty. Now, each of theſe Roots having ſeveral Organizations, which the Countrymen call Eyes, and which are analogous to thoſe in the Stalks, Boughs, and Branches of Plants and Trees, they are in no Expectation of any Production from a Piece without one of thoſe Eyes.

Another Obſervation, which tho' very ſimple, yet greatly worthy of Note, is that, when the ripe Heads of *Cabbage* are cut off from the Stalks, it is an uſual Cuſtom, with ſome Country People, to draw the Stalks out of the Ground, and tranſplant them in Rows, near each other, very deep; and they produce

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of Harm to the Body, in paſſing off undigeſted, and whoſe vaſt Numbers were highly neceſſary to be preſerved; and, as to other Fruits, their Seeds or *Oſſicula*, being generally in their Center, or however otherwiſe placed, are very eaſily ſeparable from the *eſculent* Parts.

what are afterwards call'd *Green* * *Sprouts* in Plenty; theſe grow from every Side, almoſt half Way down the Stalk, out of manifeſt Organizations, and no where elſe.

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* Whilſt theſe Plants are left in the Ground, after each one has acquired its *Head*, the *Heart* or *Germ* will grow up, thro' the Middle of the Head, until, riſing and ramifying, it runs to Seed; and the nutritious Juices, being employ'd for this Purpoſe, have not the leaſt Influence on theſe ſecondary Organizations that produce the Sprouts occaſionally, to make them grow, having now no Communication with them. This is the Reaſon why they do not grow before; but the *Head* being now cut off, and a kind of *Cicatrix* brought on, ſo as to hinder the Juices to riſe and evaporate, and theſe Juices being ſtill receiv'd in the ſame Quantity by the Roots, they are directed to the latent Organizations, but not in ſuch Plenty as when tranſplanted deep into the Ground; for by this Removal they acquire a greater Quantity of Nouriſhment than in their firſt Situation; where, if they were left long enough after the Head is cut off, without tranſplanting, they would, in Time, die away, and rot as they ſtood; for the Earth or Mould falls away

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away from their Roots, whereby they are deprived of their Nouriſhment; but when removed, as we have ſaid, into freſh Soil, they obtain a new and plentiful Supply for the Propagation of theſe *Sprouts*.

Thus, in lopping off the Boughs of Trees to the Trunk, the ſame Thing happens; for now, theſe Boughs being cut away, a *Cicatrix* ſoon comes on every Stump, and hinders the Juices to eſcape that Way; and, the Roots ſtill abſorbing the ſame Quantity of the nutritious Fluids, it muſt riſe as before, and of Neceſſity be determined to the little Organizations that are near the wounded Parts; and theſe are puſhed forth, and in Time become a new Set of Boughs, Branches, Leaves, *&c.* according to their own Natures and Qualities; but if one of thoſe Trees, whoſe Trunks have no Organizations all the Way up, was cut off in the Middle, far below the Head, or Place of the going off of the Boughs, the remaining Trunk would never produce a new Head; but, by the Redundance of Juices riſing into

it,

Another moſt evident Inſtance of that univerſal *Benevolence* and *Care*, which cannot be too often mentioned, is, that thoſe uſeful Fruits of the Earth, whoſe Propagation, from their Seeds alone, would be far more tedious in coming to their natural and neceſſary Perfection, ſhould be thus ordained, by thoſe wiſe Proviſions, to come to a more ſpeedy Increaſe and Maturity for Man's Uſe; for, if

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it, would become plethoric, and rot away for Want of Organizations. This brings before us a freſh Image of our *Analogy* between Animals and Vegetables, in the Amputation of a Man's Limb; the Stump is cicatrized, but, becauſe there's no latent Organization, no new Limb can be produced; and, as after the Recovery of the Perſon, his Appetite being reſtored, the ſame Quantity of *Chile* will be ſent into the Maſs of Blood as before the Amputation, and, all that Room in the Veſſels of the Limb being now wanting, there will neceſſarily be a *Plethora*, or too great a Fulneſs, in the whole Conſtitution, which ſometimes produces *Hæmorrhages* in different Parts of the Body and other Diſeaſes.

I am truly informed, the *Potatoe* Plant, if raiſed only from the *Apple* or *Seed*, would be two or three Years before it could produce Roots fit for Uſe.

CHAP.

CHAP. IV.

The Analogy *of the Fluids of Animals and Vegetables, with an Explanation of the* Secretions *in both.*

AS, in the general Organization of Animals and Vegetables, there is this indiſputable Analogy; ſo it alſo wonderfully holds in the Fluids that ſeverally belong to them. And, to conceive it well, we need only take a View of any particular Seed, and we ſhall find treaſured up in it not only the Organization I have been ſpeaking of, but alſo its native or *innate* * Juices; that is, a certain

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* The Exiſtence of Organizations in Seeds or Buds, that is, of primary or ſecondary ones, is manifeſt by ocular Demonſtration; now, as this is a Truth, it would be ſomewhat abſurd to imagine the Author of Nature had given them a dry, rigid, Contexture,

Quantity of every individual Fluid, which is afterwards to be found in larger Quantities, in the Tree or Plant that ariſes from

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ture, deſtitute of any Fluids at all; or, ſince they are deſtined to increaſe in Magnitude, that their Parts were not all made *vaſcular.* Some Fluids then appear neceſſary to fill theſe vaſcular Organizations, and what Fluids could be ſo proper, as thoſe which immediately proceed from the Parent Tree or Plant, being ſuch as were abſolutely neceſſary to conſtitute the Juices of the future Tree or Plant?

This being the Caſe undeniably, then it muſt neceſſarily follow, that either the future nutritious Juices, which abound in the Earth or Water, muſt be changed into proper ones for the Nature of the Plant, and aſſimilated to thoſe *innate* Fluids, already in the little Organization; and then thoſe Fluids, before this Change, muſt be ſuppoſed intirely homogeneous; or, on the other Hand, we muſt inevitably ſuppoſe them to abound with innumerable different Particles of all Qualities and Natures whatſoever, capable of being *attracted* by ſimilar Particles, and by no others, from the Seed; depoſited there, each in its peculiar Veſſel, ready to be increaſed and ſecreted in its due Order, upon the Accretion

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others, whatſoever the Plant be, or the Variety of Plants in the ſame Place. Now, as to the former Opinion, no Conception can be had of a Power, in ſo ſmall an Organization as a Seed or Bud contains, to tranſmute a ſimple Fluid into ſo many different Subſtances, as even one Plant contains; 2*dly*, I believe none will venture to aſſert, that the Juices of the Earth are homogeneous, for innumerable Inſtances before us every Day prove the Contrary, to our *Taſte*, *Smell*, and *Sight*, in almoſt every Piece of Earth we meet; wherein the *oleaginous*, *ſaline*, *ſulphureous*, *aromatic*, *ſweet*, *bitter*, *acid*, and ſo on to an infinite Variety, are every where preſent in, and ſeparable from it, upon proper Occaſions. But this will be more evident in the Sequel of this Treatiſe. However, this one Obſervation ſhall be added in this Place, that as, in many other Reſpects of Nature, the Deſign of the CREATOR appears clear and intelligible, and his Plan eaſy and ſimple; ſo, in this, it would ſeem to me the moſt natural Scheme for the Propagation of Vege-

Accretion of the Organization; and capable of being joined by *ſimilar* Particles, ariſing from the general nutritious Juices in the Earth, their natural *Matrix*.

To illuſtrate this, I ſhall here mention a few Obſervations out of many of my own, which, upon conſidering them, gave me the Notion of accounting for the natural Secretions of Animal as well as Vegetable Bodies, upon my preſent Plan; and which ſerve, more and more, to proclaim that Uniformity in theſe two general Parts of the Creation, which points out an *Allwiſe* and *Allpowerful* CREATOR.

The firſt Seed I ſhall take Notice of is that of the *Angelica*, which, after it is

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Vegetables, that there ſhould be every-where a *Magazine* of Particles, ſuited to every differing Plant, whereſoever its Seed falls, ready to be *attracted* in the Courſe of its Accretion; rather than to imagine, that the leaſt *Change*, in any Fluid, can be brought about by ſuch minute Bodies.

diveſted of its chaffy Huſk, ſeems to the naked Eye to be an uniform, browniſh, elliptical Seed; its *Parenchyma* is of the ſame Colour throughout, and appears very moiſt, when cut into, and the external Surface of the Seed, by the Help of the Microſcope, appears ſtriated, and interſperſed with a fine *Gum* * of an Amber Colour, lying in Lumps in the Ridges, and having a high aromatic Smell; thus in the *Parenchyma* are the farinaceous and aqueous Parts, depoſited for Nutrition, and, on the Surface, the aromatic Gum that affords that powerful Scent, ſo remarkable in this Plant, and in which conſiſt its medicinal Virtues.

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* Beſides the groſſer common Subſtance in every Plant, whatever Particles, whether aromatic, *ſweet*, *bitter*, *volatile*, or the like, each Plant has peculiar to itſelf, wherein its ſpecific Qualities and Virtues conſiſt, it is wonderful to behold the various Methods ordained for treaſuring them up in the Seed; ſome having them upon the Surface of the Seed, as this mentioned; others in the Center, as the Grains of Paradiſe; others in the *Oſſicula*, and ſo on, according to the Nature and Exigencies of the Plant which they are to furniſh.

The next is the Seed call'd *Granum Paradiſi*, of which the Covering is brown; within it is incloſed a black, pitchy Subſtance, much thicker than the Covering, in cloſe Contact with it, and at the Angles of the Seed it is pretty conſiderable; next to this the *Parenchyma* appears as white as the fineſt Salt, and radiated from the Center outwards, and in a tranſverſe Section ſeemed to have a round Hole in the Center of one of the divided Parts, and a Proceſs, anſwerable to it, prominent upon the other; this excited me to make a longitudinal Section thro' the Middle of another Seed, when I was agreeably ſurpriſed to find a diſtinct Piece of *Camphire* in the Middle of the white *Parenchyma*, exactly ſhaped like a *Vinegar-Cruet*, the Bottom of which was towards the *Baſis*, and the Top towards the *Apex* of the Seed.

Every one of the Tribe of *Cardomum* Seeds have the ſame Subſtances appearing in them, tho' ſomething different in their

Form from each other, even the very Bit of *Camphire* * in the Center; and that this is Camphire appears by *Boerhaave*'s Experiment: He ſays, if they be diſtilled, they yield the beſt Camphire in the World, and that it is ſo plentiful in the Plant, that it plugs up the Worm of the Still, ſo that nothing can paſs; thus, ſay he, in ſome of our Aromatics the ſame Thing happens, for the Oil of *Aniſe* and *Fennel* will concrete in the

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* There can be no better Proof of the Exiſtence of every kind of Subſtance in the general Maſs of nutritive Juices in the Earth, ſince, altho' Camphire is properly found elſewhere in large Quantities for common Uſe, yet here we find it only as a conſtituent Part of the aromatic Qualities of this Plant; and, altho' the great *Boerhaave* prov'd this beyond Contradiction by Diſtillation, yet the Manner of its being treaſured up, and its Place in the Seed, were never thought of till I was ſo happy, among many other Diſcoveries, to find it. And, as to the Quantity of any particular Subſtance in a Plant of this Nature, it will always be found as its Quantity in the Seed is to the Seed, or nearly ſo.

Worm, like Camphire, but are eaſily diſſolved, whereas the Camphire remains concreted.

I might produce many more Inſtances here of my own Obſervation, for which I refer to my Book of Seeds, and ſhall only add one more to ſerve my preſent Purpoſe, which is well enough known to every body, and that is the *Caſſu* Nut. In this the Fruit, upon the Top of which the Nut grows, is of a moſt agreeable Taſte and very cooling; whilſt the Nut itſelf, whoſe Shell conſiſts of two Tables, and a cellular Subſtance between them, contains a moſt acrimonious cauſtic Oil, famous for burning the Mouth, whereſoever it touches, and flaming fiercely over a Candle with great Exploſions; and has a Kernel as good to eat as a Cheſnut, being ſaturated with a very ſmooth ſweet Oil; inſomuch that they are eſteemed among the *Indians* as a choice Food.

How various thus are the Juices of the ſame Tree or Plant? Why are the Bark, Leaves, and woody Parts bitter, ſour, inſipid, reſtringent, whilſt the Fruit is ſweet, grateful and refreſhing? Why are the Leaves of Plants fœtid, or void of any Smell, whilſt their Flowers yield the moſt agreeable and pleaſing Odours? And, in a Word, why do the ſeveral Fruits and Flowers of the Earth differ from each other in Taſte, Smell, Virtues, and Appearance?

Theſe are Conſiderations which deſerve the moſt earneſt and uninterrupted Application towards their Inveſtigation; let us now make ſome Attempt to explain them, which are at firſt Sight ſo myſterious, and thereby endeavour to render the proviſional Care of God more and more conſpicuous, in ordering theſe ſignificant Marks of his Divine Pleaſure for the Benefit and Recreation of us, his Creatures, to whom he has given Organs capable of diſtinguiſhing and enjoying theſe agreeable Odours, Taſtes, and Beauties of the Vegetable World.

We muſt then conſider the nutritive Juices produced by the mutual Concurrence of the *Air*, *Water*, and the *Earth*, the natural *Matrix* of the Vegetable

Kingdom, to be an heterogeneous Fluid; compoſed of all the Species of Juices which are found in every Part of all Trees or Plants whatſoever; and this muſt be look'd upon as the general * Magazine

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* We ſee even the Pine-Apple is now propagated among us, by procuring it a conſiderable Degree of Heat; which ſhews, that the peculiar Juices to this charming Fruit are in the Manure by which we cultivate it; and thus there can be no Doubt but that *Sugar-Canes*, *Spices*, or any other *Exotic* might be alſo cultivated and improved, if the due Degree of Heat neceſſary for them could be continually aſcertain'd to them, which from our Situation and Diſtance from the *Sun* is impoſſible; for no Doubt but the *Saccharine*, *Spicy*, and all other Juices are in the general Magazine, in every Nation whatſoever; and if they are not in ſuch Maſſes and Quantities in ſome, as in their peculiar native Plants, yet they every-where are plenty in others, as component Parts of their Juices. What, but *Saccharine* Juices, gives the mellow Sweetneſs to the ripe Apple, the Cherry, the Pear, the Plum, *&c.* altho' varied in Taſte by the different Admixtion of

zine of Proviſion for all thoſe Vegetables which are nouriſhed by them, in whatſoever Climate they grow. And then we muſt look upon the Seed or *Ovum* to have treaſured up in it, originally, an innate ſufficient Quantity of every one of the particular Juices of its Parent, each in its own peculiar Veſſel, proportioned to the Capacity of its Receptacle, whether it be a primary or ſecondary Organization of Tree or Plant; or, in other Words, whether it be the *Seed* or *Bud.* And, next to this, we may obſerve, as in the ſeveral Inſtances above-mentioned, a *Congeries* of Subſtances comprehended in the *Parenchyma* of every Seed, the very ſame with thoſe different *innate Juices* natural to the

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of other peculiar component Juices of theſe ſeveral Fruits? What, but the ſpicy Juices, gives the warm Pungency to our different aromatic and cephalic Plants? The *Capſicum* thrives here and produces very large Pods, which every one knows are ſufficiently pungent and hot; but there is no Need of further Endeavours to prove what innumerable Inſtances may be brought from every Place to confirm.

little Organization, which are contained in this Seed along with it, and incloſed in the ſame Covering, intended, as the firſt Supply, to be received for Nutrition by the tender Parts of the Organization; until it is capable of *receiving*, *ſecreting*, and being nouriſhed by the proper Juices out of the general Fluid mentioned, always ſufficiently abundant in this natural *Matrix*, the Earth.

But now we are to conſider the Manner of the Secretion of theſe peculiar Juices, into the ſeveral Veſſels in the little Organizations; which probably may be in the following Manner: As ſoon as the Seed is put into its natural *Matrix*, the Earth, its Caſe or Covering is ſoon burſt open, by the Acceſs of Moiſture and Heat, which, gradually, firſt diſſolve the ſeveral nutritious Juices ſupply'd by the *Parenchyma*, and put them in Motion; whilſt, at the ſame Time, the Organization is releaſed from the Preſſure of this *Parenchyma* by Degrees; and now the abſorbent Veſſels or *Radiculi* of the Organization, being touched on all Sides, by the Fluids of the diſſolved *Parenchyma*, receive it, and carry it up to the little ſecretory Veſſels, none of which will admit any other Particles of the general Fluid to paſs into them, but ſuch as are *ſimilar* to that which it contains already *; they alone being capable of being *attracted* by their *kindred Particles*; and, as the Quantity is thus increaſed within, the *Attraction*

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* The great Mr. *Boyle*, in his *Origin of Forms*, ſays, that after having nouriſhed Slips of ſeveral Kinds of Plants in Water, and obſerved them well, he thinks that there may be a real ASSIMILATION and TRANSMUTATION of Water into the Subſtances of the Vegetable; and infers that the ſame Corpuſcles, which, convening together after one Manner, compoſe that Fluid, inodorous, colourleſs, and inſipid Body of Water, being contexted after other Manners, may conſtitute differing Concretes, which have Firmneſs, Opacity, Odours, Smells, Taſtes, Colours, and ſeveral other manifeſt Qualities, and that too very different from one another. He is alſo ſurpriſed that ſimple Water ſhould be turned into a Subſtance of ſuch a piercing cauſtic Nature in the *Ranunculus*, as to raiſe Bliſters on an human Body; and yet (ſays he) perhaps it is no leſs ſtrange, that a Plant conſiſting chiefly of *tranſmuted* Water did

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did by Diſtillation afford us a true Oil, that would not mingle with Water, and conſequently was eaſily convertible into Fire.

This great Man talks every-where of the Change of the Water into other Subſtances, by the different Modification or *Convening* of its Parts; which he was neceſſarily led to imagine, ſince he was prepoſſeſſed with the Opinion that Water is ſimple, inſipid, colourleſs, *&c.* and conſequently a homogeneous Fluid, and at the ſame Time ſee its wonderful Effects in increaſing Plants; but by conceiving Water a heterogeneous Body, which is manifeſt from the above Explanation, and conſidering the Certainty of the attractive Power in ſimilar Fluids to each other, as of Oil to Oil, *&c.* the Difficulties and Obſcurities will be removed; nor is it any more Wonder, that Water ſhould be compoſed of various differing Particles, and yet appear colourleſs, *&c.* than that the general Rays of Light ſhould be colourleſs, and yet compoſed of particular colour'd Rays, as they appear, when decompoſed and ſeparated by the *Priſm.*

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Attraction will grow ſtronger, and the Explication of the Plant be more accelerated,

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Homogeneity is not to be found by any human Inveſtigation in any kind of Body whatſoever; the moſt nice Operations in Chemiſtry can never produce an ultimate ſimple Body, and thoſe ſo counted by Chemiſts are yet diviſible into others which are yet compounded of others, and ſo on beyond a Poſſibility of human Conception. After every Part of a Plant has attracted its own kindred Particles out of the Water, even the ſweet Flower itſelf, its expreſs'd Juice, will be found compounded of very different Particles, and ſo will the moſt ſimple Fluids in Animal Bodies; even our own weak Enquiries can ſhew us ſo much by analyſing Milk, Chyle, or any other ſecreted Juice from the general Maſs; and, who can ſay the moſt refin'd eſſential Oil or Spirit is not yet compounded of other conſtituent Parts? The groſſer Operations of Nature only come within the Sphere of our groſs Underſtandings, but all that regards extreme Minuteneſs in every Reſpect is utterly beyond that Sphere. And, in ſhort, we muſt at laſt own that the different Particles, that go to conſtitute the moſt ſimple Bodies we are acquainted with, are innumerable rated, till the Organization arrives to its full Growth; each Part carrying on its particular Buſineſs; ſome attracting and and ſeparating to themſelves, out of this general Fluid that is driven up, the Juices of the Leaf; ſome of the Gum; ſome of the Flower; ſome of the Fruit; and ſo on, till the full Completion of the Whole, whether of Tree or Plant; according to their peculiar Natures and Neceſſities; for when the general Fluid

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rable, and never to be comprehended by any human Power; whence one would eaſily be influenced to conclude, that every ſenſible Part of the Creation is compoſed of Particles of a ſurpriſing Variety of Qualities, which, according to the different Proportions of their Quantities in the Compoſition of each Body of whatſoever Nature or Kind, cauſes the apparent Difference to be every Day found amongſt them. And, in order to conceive this the better, we need only to caſt our Eyes on the ſurpriſing Variety of different Colours, that are to be compoſed out of four or five only, by altering their Proportions in mixing them; juſt ſo it is with Regard to Taſtes, Smells, and every other Quality whatſoever in all Bodies.

is carried to the ſecretory Veſſels, and each has ſeparated and attracted its own Particles, the others, which are heterogeneous to theſe, paſs over theſe Orifices, and are attracted in their Turn, into thoſe wherein their innate kindred Juices lay before, and by no others; the Roots always receiving the general Maſs of Fluids for thoſe Purpoſes.

The Juices attracted into a Tree or Plant, being the general Maſs, as is obſerv'd before, which is compoſed of Particles of innumerable various Subſtances, it is no Wonder, after every Part of any Tree or Plant has attracted its kindred Particles, that the ſuperfluous Juices ſhould be carried off by Perſpiration, which is chiefly done thro' the Leaves; for we may obſerve, that theſe not only ſerve to bleſs the Eyes with their Verdure, the Noſe with their charming Savours, and for many medicinal and nutritive Uſes according to their Natures, but are alſo *Emunctories*, by which thoſe Juices, which have no kindred Particles in the Tree or Plant, are carried off. And it is evident, that when the Sun's genial Influence begins to rarify the Fluids, which, during the inclement Winter's Cold, had been render'd ſluggiſh, that then new Leaves are put forth from their ſeveral Organizations to ſerve as well for excretory Glands, for the Welfare of the Tree or Plant, as for the other Occaſions mention'd. For we ſee, when by the Approach of Winter no more Fluids riſe into Vegetables, there can be no Perſpiration, and conſequently no Uſe for Leaves any longer in the greateſt Part of them; wherefore they fall off, and are not ſucceeded by others, till the Vegetable begins to receive freſh Nouriſhment, and has Occaſion therefore of excretory Glands to carry off Superfluities. How extremely this imitates the Conſtitution of Animal Bodies? What do the ſuperfluous Juices, which are daily carried off by Perſpiration from Animal Bodies conſiſt of, but of ſuch Particles as are heterogeneous to whatever are their native conſtituent Parts; or, in other Words, which have no kindred Particles in the Animal? And what can produce greater Evils in either Animals or Vegetables than an Obſtruction of that Perſpiration? The more Animals and Vegetables are nouriſhed, the more they perſpire; becauſe, the greater Quantity of the general Maſs is convey'd to either, there will be the more heterogeneous Matter to be carry'd off, ſince all the Food, of every Kind, that is taken into an Animal, and the nutritious Juices that ſupply the Vegetable Body, conſiſt of a great Number and Variety of other Particles, beſides thoſe that are natural to them.

This Perſpiration of the Leaves appears neceſſary upon another Account; it is one of the chief, if not the only Aſſiſtant to the Attraction of the general Maſs upwards; and this appears by an Experiment of the learned Doctor *Hales*, in his 35th Experiment of the ſecond Volume of his *Vegetable Statics*, ſecond Edition, where he ſays, " Now, ſince this " Flow of Sap ceaſes at once, as ſoon as " the Vine was cut off the Stem, the " principal Cauſe of its Riſe muſt at the " ſame Time have been taken away; " *viz.* the great Perſpiration of its " Leaves." This ingenious Gentleman's Experiments lead him to conſider the great Efficacy of Attraction, that *univerſal Principle*, which is ſo operative in all the different Works of Nature, and eſpecially in Vegetables, whoſe minuteſt Parts are ſo ranged, as is beſt adapted to attract proper Nouriſhment: " It is by this " Principle (ſays he) that we ſee Plants " imbibe Moiſture ſo vigorouſly up " their fine Capillary Veſſels; which " Moiſture, as it is carry'd off in Perſpira- " tion, by the Action of Warmth, there- " by gives the Sap Veſſels Liberty to be " almoſt continually attracting of freſh " Supplies; which they could not do, if " they were full ſaturate with Moiſture: " For without Perſpiration the Sap muſt " neceſſarily ſtagnate, notwithſtanding " the Sap Veſſels are ſo curiouſly adapted " by their exceeding Firmneſs to raiſe " the Sap to great Heights, in a recipro- " cal Proportion to their very minute " Diameters." The Doctor was perſuaded by every Experiment he made, that the Attraction of perſpiring Leaves is much greater than the Force of *Truſion*, from the Column of Water; and that the Capillary Sap Veſſels, out of the bleeding Seaſon, have little Power to protrude

Sap in any Plenty beyond their Orifices, but, as any Sap is evaporated off, they can by their ſtrong Attraction, aſſiſted by the genial Warmth of the Sun, ſupply the Quantities drawn off by Perſpiration. However, it ſhall be ſhewn there can be no truſive Force for raiſing nutritious Juices into Vegetables, and that there is no other Way but by *Attraction*, in the Notes on the End of this Chapter.

Now that this Doctrine of *innate Juices* may not appear doubtful, and that it may be render'd yet more plain, we will cite ſome Experiments, and other Obſervations, that I think will ſufficiently prove it, even beyond Exception.

Every Field gives us innumerable Inſtances of the Truth of this our Doctrine; let us only take a Part wherein we ſee great Variety of Plants; and we ſhall find, in many Places, ſix or ſeven different ones growing in three or four ſquare Inches of Ground cloſe together; do not all theſe imbibe their Nouriſhment from the ſame general Maſs, and, yet, is not one a *bitter*, another an *inſipid*, another a *ſour*, another a *ſweet* a *ſweet* Plant, and ſo on of the reſt? * ſo in like Manner in Groves of Trees, Woods, and Foreſts, does not each ſpecific Tree differ in its Qualities from its Neighbour of a different Species, notwithſtanding their being all fed by the ſame general Maſs of Fluids, each Species retaining always its own natural Form and Qualities, without Alteration, for ever; altho' their ſeveral Roots are interwoven with each other thro' the ſame Maſs of Earth.

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* The little *Bird*, whoſe Food is only ſimple Seeds and Water, draws a daily *Pabulum* from them, for every differing Part of the Solids and Fluids of his Body: And all the different Subſtances in the *Ox* or *Sheep* are well ſupply'd by bare Graſs and Water. Every Morſel of Food, tho' never ſo mean, which is commonly the Suſtenance of Mankind, is, ſoon after it is receiv'd into the Stomach, capable of being analyzed into a vaſt Variety of Subſtances, ſuited to every individual Part of the Body; and may therefore be truly call'd a Part of that univerſal Magazine of Proviſion we have been ſpeaking of.

And further, if two or more different Flower Roots be placed upon the ſame Glaſs of Water, they will all receive the ſame general Maſs of Water into the abſorbent Veſſels of their Roots; yet each Root, in the Explication of its Organizations, will ever be conſtant to its natural Form; producing its own particular Stalks, Leaves, and Flowers, each having its own particular *Taſte* and *Smell*, and, in a Word, never deviating from the Laws to which they were firſt limited. How can this happen, if it be not according to the Principles juſt laid down? Wherein it is plain, each diſtinct Veſſel leading to Leaves, Flowers, *&c.* is furniſh'd with its own innate Juice, which is capable of attracting from the general *heterogeneous* Maſs of Fluids, in the Glaſs, Particles ſimilar to itſelf, and incapable of mixing with any others, on any Account.

But here are other Examples yet more powerful in our Behalf, which are experimental Proofs, and which we may venture to affirm to be very concluſive; and theſe are what regards *Grafting* and *Inocu-*

lation of Trees. The latter will be ſufficient for our Conſideration here, as both are carried on upon the ſame general Principles.

Inoculation is no more than Cutting out a Bud, or *ſecondary Organization*, from one Tree, and Opening the Bark of the Stock of another, and there inſerting it, as it is practiſed by Gardeners, into what may be juſtly called a proper *Matrix*; where it receives nutricious Juices, inſinuates its *Radiculi* into it, and at length from the general Maſs brought up to it, by the Stock, every individual Part of the Organization, having its * own innate Juices

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* *Virgil*, in his *Georgics Lib. II. Line* 33, ſeems to be of Opinion that the Stock, upon which a Graft or Inoculation is made, is chang'd, in theſe Words:

Et ſæpe alterius ramos impune videmus
Vertere in alterius, mutatamque inſita mala
Ferre pyrum.

And this ſeems alſo the Opinion of ſeveral others; but let us here aſk, how it is poſſible the Nature of the Stock can be chang'd, which

Juices already depoſited in it, attracts, from the Whole, its ſimilar kindred Particles, and carries

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which now is grown ſtrong, its organis'd Parts confirm'd, and abſorbing the Nurture of the Earth in great Quantities, by the Inſertion of a minute Bud, which muſt receive its whole Suſtenance from the Stock? Would it not be more probable that the Bud, which is ſo tender an Organization, ſhould be more liable to be overcome, and chang'd into the Nature of the Stock, whoſe natural nutritive Juices are riſing in great Plenty, if there were any Changes or Deviations, from the ſpecific Standard of Nature, allow'd of by the Divine Author? But how minute and tender ſoever that Organization in the Seed, or this ſecondary one in the Bud, is, ſuch is the *Rigidity* and *Conſtancy* in the firſt great Command, that even they, in their moſt minute weak State, ſhall not, to the End of Time, deviate in the leaſt Tittle from their true Standard, into whatſoever *Matrix* they are inſerted; therefore no Syſtem can account for theſe Phænomena, but this, which is all along ſo ſuitable to every Part of the Animal and Vegetable Worlds, nor can any be ſo eaſily and naturally comprehended.

carries on the Work, as I have explain'd it before.

Now

The niceſt Obſervations cannot diſcover any Change in the Texture or Juices of the Stock, nor, as I have obſerved already, can there be any Degeneracy of one Kind from itſelf ſpecifically; Fruits or any other Productions of Plants after Cultivation can never be ſaid to degenerate, but may be ſaid more truly indeed to return to their former State by being neglected; any wild Fruit or Flower, brought into Gardens, and cultivated by the ſkilful Gardener, will be meliorated in every Reſpect; but then neglect theſe, and let them remain Year after Year unregarded, and they will return to their former State; ſuch only as they were, before they were removed, and will ever continue in that which was their true natural State without growing a Jot worſe: Which is apparent in the wild Fruits of the Field to this Day; they are every Year neither better nor worſe than the laſt, but are capable of being made better, more full, more abundant in Juices, and pleaſant in their Flavours by Cultivation; but can theſe Variations be call'd a Degeneracy? We ſee in every Field

where

Now altho' this little Organization is ſo ſmall and tender, when it is thus placed in

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where Cattle run, that the Graſs round about the Ordure of any Beaſt has larger and greener Leaves, than the neighbouring Graſs any where about, tho' the ſame Species with them; and, in Fields well manured, all the Graſs and Herbage ſhall appear by many Degrees better, as long as any of the ſuperabundant nutritive Juices from the Dung continue to ſupply them; but, when theſe adventitious Juices are intirely expended, the Graſs and Herbage, from the very ſame Roots, ſhall return to the ſame State, with thoſe which grew from them before they were manured, without the Change of the leaſt Fibre of any. The Reaſon is clear and obvious; the ſuperabundant Juices being attracted in greater Quantities, together with thoſe in the Earth before, by the Plant, it is no Wonder they ſhould appear better than before. Is not this the Caſe with Animals; are they not fatted, and every Way improved by being taken up and fed in a more plentiful Manner? But then, by being turn'd looſe again and neglected, they will return to their former in the Stock, and altho' it be the Bud of a Pear-Tree inſerted into the Stock of any other Tree; yet we ſee it deviates not from its own natural State, but grows into a Pear-Tree like the Parent from which it was taken, producing Bark, Leaves, Bloſſoms, and Fruits like its Parent in all Reſpects, and in no wiſe like that of the Stock which conveys to it the general Fluid that nouriſhes it.

Theſe Obſervations enable us to take a ſhort View of the Animal Fluid and its

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former Aſpect and Condition. It is the *Flavours* and *Taſtes* of Fruits and Flowers that are augmented and heighten'd; but the real *Qualities* of their Juices not at all alter'd, no more than the Organization is: For theſe are eſſentially the ſame in Vegetables and Animals for ever. Fruits and Flowers will be greatly variegated in their Colours by Cultivation, even the ſame Species; and this Variegation has led ſome Botaniſts to multiply the Species; but let theſe alſo be neglected, and all their beautiful Varieties ſhall return to their original Simplicity, and prove that no Part of them has been really changed in the leaſt.

Secretions in the Body; and in this likewiſe the ſame Scene of Order, Uniformity, and *Analogy* will preſent itſelf in as lively Colours; and, in order the more clearly to explain it, we muſt premiſe a Word or two concerning the Animal *Ovum*. I have before defined it an Egg containing an Organization, capable of growing into no other than the ſame Species of Animal that produced it; and conſidered that the Integuments of this Organization are the Membranes to which the *Funis umbilicalis* and *Placenta* are fixed; and that, therefore, the little *Placenta* is on the Outſide of this *Ovum*, which has abſorbent Veins to receive Nouriſhment, and convey it to the Organization of the *Fœtus* by the *Funis*; it muſt alſo be obſerved, that every Veſſel, Gland, *&c.* are already formed, however they may, from their Minuteneſs, eſcape our Sight; and that each individual Gland is furniſhed with its own innate Juice, depoſited there, as I have ſaid of the Vegetable Organizations, when they were formed.

Now, as ſoon as the impregnated Animal *Ovum* paſſes from the *Ovarium* into the *Uterus*, its natural *Matrix*, the abſorbent *Venulæ* or *Radiculæ* of the *Placenta*, receive the general Nouriſhment, and convey it to little Organization of the *Fœtus*. Here, as is ſaid of the general Fluid of Vegetables, the Mother's Maſs of Blood muſt be conſidered as the general Animal Fluid, containing all the Particles of Nouriſhment neceſſary for the *Fœtus*, and alſo ſuch as are ſimilar to all the ſeveral innate Juices of the Organization; and that, when this general Fluid is carry'd to the *Fœtus*, it is diſcharged into the Veins, and paſſes through the Heart into the Arteries, and is diſperſed to every Part of the Organization, and, as it paſſes to the ſeveral Parts to be nouriſhed, every Part receives, from its own kindred Particles out of the Maſs, what is naturally ſuitable to its own innate Juice, and the reſt is driven on to their ſeveral Places *. Thus the Liver having its innate Juice, the Bile, when the general Maſs of Blood paſſes over the Ducts and Paſſages leading into its Subſtance, none is admitted to enter but the bilious Parts of the Maſs, which alone are capable of being attracted by their kindred Particles; and ſo of the *Pancreas*, and all other Glands of the Body.

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* Notwithſtanding the great Sagacity and Learning of Authors, in accounting for the Secretions

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Secretions in Animal Bodies, nothing has appear'd of that Sort that was not liable to great Objections; in vain have they ſought for Particles and Pores of different Configurations; in vain had Recourſe to the *Momentum* of the Blood, and in vain endeavour'd to reconcile the Doctrine of Secretion to Mathematical Calculation. The Secretions are performed in a more plain and ſimple Manner, than their ſeveral intricate Accounts and Solutions ſeem to make them, and indeed ſo are all the Operations in Nature. It is Man that renders the moſt clear Facts unintelligible, for Want of entering clearly upon conſidering and obſerving them as they really are: Imagination is ſometimes very looſe, and is eaſily led aſtray for Want of the great Regulators, *Doubt* and *Deliberation*, which are the trueſt Aſſiſtants in attempting to make new Diſcoveries.

IF this be not the Mechaniſm of Secretion in Animal as well as Vegetable Bodies, who can ſay why the *Liver* has a bitter, the *Pancreas* an agreeable Taſte, and ſo on of the reſt; why, I ſay, have the Brains of Animals one kind of Taſte and Colour, the Fat another, the muſcular Fleſh another, and why does this laſt even differ in different Parts of the Body? I could ſay a great deal here, that would eaſily confute every other Opinion that was ever produced concerning the Secretions, but this Treatiſe is not deſigned for Controverſy, but for the Delivery of a Chain * of Thoughts, which I hope will ſerve to illuſtrate ſeveral intereſting Matters; and, therefore, I ſhall now only add to what

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* When a Chain of Reaſoning has its firſt Link ſecured by Facts, there is great Hope of running on to many Diſcoveries, which will always carry Truth and Conviction along with them. I am naturally led here to advance another Philoſophical Enquiry concerning the Poiſons of ſome Creatures and other Circumſtances of others, which I think can admit of no Solution without this Plan juſt laid down. It would ſeem by

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by the following Obſervations, that, in all Animal and Vegetable Subſtances too, there is a *Pabulum* of pernicious as well as ſalutary Particles, ready to be attracted by ſome Creatures, and not attracted by others who feed on them; for, in every Animal, there are organiz'd Parts we call Glands, each having its own innate Juice in it, ready to attract out of the general Maſs of Aliment which is in every Creature, whether Animal or Vegetable, taken into and digeſted in the Stomach, in the Courſe of the Circulation, the pernicious, the bitter, the inſipid, *&c.* which ſoever is analogous to that already *innate* in the Gland, which is hereafter further explain'd. Why is the Fleſh of the Viper wholeſome and nouriſhing Food, whilſt the Juice iſſuing from his Tooth is poiſonous?

What ſupplies this poiſonous Juice, and that of the Rattle-Snake, when he has expended all the Gland had ſtored up in it? Is it not ſupply'd from his common Aliment, and can there be any Thing elſe that ſupplies the Secretions of any Gland in Animal what I have ſaid, the celebrated Mr. *Winſlow*'s Opinion concerning the Secretions, delivered

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mal Bodies but this? If this be true, is there not a *Pabulum* for each in the Inſect, the Bird, the Squirrel, Rat or Mouſe? And who can doubt but that (if Water alone, or Dew, was the ſole Nutriment of theſe Animals) they would be ſupply'd ſufficiently from it with that ſame Juice?

How is the *Ink-Fiſh* ſtored with a black Juice, which ſerves him to change the ambient Water into a dark Cloud, thro' which he eſcapes his purſuing Enemies? Is it not from his Aliment, which conſiſts of other Creatures, He is furniſhed with it; and has he not a particular Gland wherein it is ſeparated from it? I muſt be indulged to aſk another Queſtion or two, which will take off any Objection that can be raiſed againſt what is here advanced, and that is, why has not the Salmon, Trout, or other Fiſh, whoſe Food is the ſame, this black Juice, or why is not the common Snake poiſonous, which is nouriſhed by the ſame innocent Food, as well as ſeveral Species of other Serpents, which we know to be quite innocent? Is it not, delivered in a ſhort Memoir to the *Royal Academy of Sciences*, which he illuſtrates with

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not, becauſe they have no ſuch Glands nor innate Juices belonging to their general Organization, and conſequently cannot attract any; for as, in Vegetables, no Juice is receiv'd into any from the general Maſs of Aliment, but what is attracted by a kindred Juice already in it; ſo, in Animals, no ſort of Juice is retain'd from the general Maſs taken into the Stomach, but what is analogous to ſome Juice or other, which is natural to, and fit for the Animal; the reſt all go off with the excrementitious Matter of whatſoever Kind.

But if it ſhould be demanded, ſince there is ſuch a Portion of pernicious, as well as wholeſome, Particles in all our Aliment, whether Animal or Vegetable, why do we not ſuffer ſome Harm at one Time or other from their Uſe? To anſwer this, we are to conſider, that ſuch Particles as are component Parts of the general Maſs, are in very ſmall Quantities; that they are intimately blended with infinite Numbers of others, of all Qualities; that they cannot be ſeparated or unlock'd from the general Maſs by any Means,

with an Experiment that gives Force to all I have ſaid on the Subject; and which
I fell

Means, but one, and that is, by being attracted into a peculiar Gland with its innate Juice, as I have juſt mention'd; till then, it paſſes on as a conſtituent Part of the general Fluid; and further, if a Quantity of that of the Viper, or even of the Slaver of a mad Dog, was taken into the Stomach, it would have no ill Effect, as it would be liable to Alteration by Digeſtion, and Admixtion with other Juices; for there are many Things we take into the Stomach daily, without any ill Effect, which, if immediately injected into the Maſs of Blood, would produce inevitable Death.

This is a Secret that appears to have been well known to that admirable Poet *Lucan*, in his *Pharſalia.* See Line 604 of his ninth Book, where, deſcribing the Diſtreſſes of the Army commanded by *Cato* in *Libya* for Want of Water; after enumerating all his Virtues, and ſhewing that, till now, he was the laſt that always drank in his Army to refreſh him, now *Paints* him drinking firſt of a Fountain, whoſe Waters were filled with vene-
mous

I fell upon with great Pleaſure, thinking myſelf happy in having the ſame Thoughts

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mous Serpents of different Kinds, to encourage his Men to drink to ſave their Lives, in the following Words:

——————Jam ſpiſſior ignis,
Et plaga, quam nullam Superi mortalibus ultra
A medio fecére die, calcatur, & unda
Rarior: inventus mediis fons unus arenis
Largus aquæ: ſed quem ſerpentum turba tenebat
Vix capiente loco. Stabant in margine ſiccæ
Aſpides, in mediis ſitiebant Dipſades undis.
Ductor, ut aſpexit perituros fonte relicto,
Alloquitur: Vana ſpecie conterrite leti
Ne dubita miles tutos haurire liquores:
Noxia ſerpentum eſt admiſto ſanguine peſtis:
Morſu virus habent, & fatum dente minantur:
Pocula morte carent. Dixit; dubiumque Venenum
Hauſit: & in tota Libyæ fons unus arena
Ille fuit, de quo primus ſibi poſceret undam.

It was alſo known in *Germany* not many Years ago to a *Mountebank*, who deceiv'd the People, and deluded them to buy vaſt Quantities of a Medicine which,he pretended, preſerv'd Men againſt the Infection, and expell'd Poiſon;

Thoughts about it through my whole Analogy, that he had in the Animal Oeconomy only.

In this Memoir, after he has conſidered the Structure of the Veſſels of the Glands

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Poiſon; which he did by cauſing an enraged Viper to bite a Piece of Bread before the Spectators, which he eat up before them, and, in ſome Time pretending to be convulſed and affected by the Poiſon, he took ſome of his Medicine, and, ſo carrying on the Farce, gradually, put on better Looks, and ſeem'd at laſt perfectly recovered; but at preſent it is a Fact pretty well known over *Europe.*

To this Note it will not be amiſs to add another Query or two; do not many other Animals of the Foreſts feed on the ſame Proviſions, with thoſe which produce the *Muſk* and *Caſtor?* And yet theſe Productions are peculiar to theſe Creatures; and, to carry this a little further, do not ſtinging Nettles grow upon the ſame Spot with many other Plants? Yet they have their peculiar acrimonious Juice, iſſuing from their pointed *Spicula*, all over the Plant, as the Poiſon of a Rattle-Snake iſſues from his Tooth.

of the Body, he goes on to conſider the Manner of their ſeparating their peculiar Juices from the Blood, as follows:

"It is a Thing well known to Philo-
" ſophers, and particularly to Chemiſts,
" that a Piece of waſte Paper, which
" conſiſts of a Parcel of Filaments con-
" nected together, being once ſoaked in
" Oil or Water, will not ſuffer any other
" Liquor to paſs thro' it, but ſuch as it
" was ſaturated with before; ſtopping all
" others. They alſo know that Scraps of
" Cloth or Cotton imbued with Oil or
" Water, and dipped in a Veſſel, in
" which Oil and Water are mixed toge-
" ther, that which was ſaturated with
" Water, will ſuffer nothing to paſs but
" Water, and that which had the Oil
" will let nothing paſs but Oil.

"I find in the ſecretory Veſſels of the
" Glands a ſimilar Structure, an inter-
" woven Maſs of Filaments, * very like
" thoſe

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* The Texture of a Spunge of any Species is the ſame, a Maſs of Filaments interwoven with

'ticle of Paper, Cork, or Cotton, tho'
'[illegible] a little [illegible]. This Tex-
'ture,

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with each other, and communicating; and it is pretty much the ſame with the Texture of the medullary Parts of Trees or Plants in their ſeveral Veſſels, tho' never ſo minute; is not this the moſt proper Texture for abſorbing Moiſture of any Kind? If a Tube of any given Length was cloſely fill'd with a Spunge from End to End, and one Extremity dipp'd in Water, it would abſorbe the Fluid inceſſantly, till quite full; then the Fluid would ſtagnate and be at reſt; but, if by any Means the Fluid was drawn off at Top, as conſtantly as it was abſorbed at Bottom, the Attraction would continually go on, as long as any Supply remains; now, beſides the Perſpiration of the Leaves, ſeveral other Things concur to favour this Attraction: This medullary or ſpungy Texture is commonly larger upwards to the Extremities than downwards in Proportion, and therefore has the greater abſorbing Force. The Air is alſo a Spring, which is no ſmall Aſſiſtance to the Motion of Fluids either attracted or propell'd, and therefore of Uſe in this, and the mutual Attraction

of

" ture, once filled with a certain Juice,
" will let none paſs through, of all the
" Juices

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of ſimilar Particles to each other; theſe Circumſtances, join'd to Doctor *Hales*'s Experiment of cutting off the Vine, combine to prove that there is no truſive Force whereby Fluids can be carried up into Vegetables; but that they are drawn into them by Attraction ſtrongly exerted by all theſe concurring Powers. It is very natural that the Air, which is abundant in the Fluids of either Animals or Vegetables, ſhould tend upwards, when once they are abſorbed into the Veſſels, and thereby contribute much by its Elaſticity to elevate them, ſince the Reſiſtance is leſs upwards, towards the Extremities, than downwards, from whence the Maſs is perpetually advancing; and that the Air occupies great Part of the Fluid, is evident from Doctor *Hales*'s 34th Experiment upon a Vine, which he cut off within ſeven Inches of the Ground: He ſays, when the Sun ſhined hot upon the Vine, there was always a continued Series of Air-bubbles conſtantly aſcending from the Stem thro' the Sap in the Tube, in ſo great Plenty, as to make a large Froth on the Top of the Sap; which ſhews the great Quantity [illegible] in the [illegible] between the [illegible] in the Orifices of these [illegible] with which they were [illegible]

[illegible] the Blood which [illegible] a homogeneous Fluid, but as compounded of an [illegible] of different *Minerals*, and [illegible] mucilaginous, watery, [illegible] saline Particles, being carried by the Arteries into the [illegible] divides itself into all the little Ramifications of the Artery, where [illegible] and wherein [illegible] the Vessels [illegible] the off, [illegible] by the streight [illegible] of the Artery into the Vein, and consequently [illegible] the Ori-

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[illegible] which is drawn in thro' the Roots and Stem. [illegible] the Experiments upon Plants in the Air-pump, of which I have made many upon exhausting the ambient Air, shew that all Plants whatsoever have a surprizing Quantity of Air, constantly mixed with them, which is of the utmost Consequence, with Respect to their Motion and other Advantages.

" fices of the ſecretory Veſſels of the
" Glands, whoſe *villous* Texture is be-
" fore ſaturated with a Juice of a certain
" Nature; and theſe Particles, which are
" of the ſame Nature with that Juice
" which preſents itſelf at the Orifice, or
" Entrance of the ſecretory Veſſels, join
" themſelves to it, and enter with the
" greater Liberty, being puſhed on by
" thoſe that follow them; that they ſuc-
" ceſſively run through the whole Veſſel,
" and at length paſs out by the excre-
" tory Canal, whilſt the others which are
" not of the ſame Nature, roll over the
" Orifice of the ſecretory Veſſel, without
" ever mingling with the Juice they meet
" there, and paſs on to the returning
" Vein to gó to the Heart again.

CHAP. V.

Of the ſecondary *and* ſubordinate *Organizations of different Animals; of the* Polypus *and other Animals multiplied by being cut in Pieces; of the* Indiviſibility *and* Immortality *of the* animating Principle; *and of Man's peculiar Advantages beyond thoſe of other Animals.*

LET us now paſs to the ſubordinate Organizations of ſome Animals, and there be Witneſſes of many more Inſtances of the Divine Benevolence than we have already mentioned; and firſt let us conſider that, in what we vulgarly call the more perfect * Animals, ſeveral of theſe

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* The vulgar Prejudices of the World lead Mankind very often into the moſt abſurd Notions of many Parts of the Creation; and alſo

Organizations are placed, where the Parts could not poſſibly do without them; what

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alſo of the Divine Purpoſes for which they were made. To call any the moſt minute Animal or Plant imperfect, or to ſay that Man, meerly as an Animal, is more perfect than the ſmalleſt Inſect, is one of thoſe Abſurdities; for Perfection in an Animal, let his Form be what it will, conſiſts in no more than his being capable of performing the proper Functions during his Life, and anſwering the deſign'd Ends, for which he mas made. And, indeed, there appears no leſs of that Divine Wiſdom, in the Form and Structure of the moſt minute, than is evident in the greateſt Animal we have before us in the World; if we may be admitted to compare great Things with ſmall, we may bring a Compariſon Home that will render it pretty clear: There is no more Perfection in the fineſt Clock, Watch, Cabinet, or whatever a mechanical Hand can produce, than in the moſt ſimple Utenſil in a Kitchen, provided it anſwers the End, for which it was made; for, notwithſtanding the additional Ornaments of the moſt exquiſite Piece of Workmanſhip, if it does not anſwer the End, it is not perfect;

[illegible] distinguishing this [illegible] Vermin [illegible] the [illegible] and [illegible] Agencies [illegible] which Sensations [illegible] which natural Right to [illegible] is as great [illegible]

[illegible] applauding the Custom of the Jews [illegible] the Mahometans in this Particular, which regards their Manner of killing their Animals; their Law allows [illegible]. The Person appointed for this Purpose is obliged to prepare a Knife of a considerable Length, which is made as sharp as the keenest Razor, the utmost Care being taken, that the least Notch or Inequality may not remain upon the Edge; with this he is obliged to cut the Throat and Blood Vessels at one Stroke, whereby the painful Manner of knocking them down, which from the primary Organization they belong to? It is well known, that, when theſe fall off by Diſeaſes or other Accidents, others ſucceed; the Reaſon for their being thus placed is, that as the nervous Parts under them are ſo exceſſively tender, as not to be capable of bearing the leaſt Touch without exquiſite Pain *, ſome-

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which often requires ſeveral cruel Blows, and ſtabbing them in the Neck with a blunt Knife, are avoided. It was a Law founded upon true Reaſon, that whatſoever Beaſt was mangled in killing for Food, ſhould be accounted unclean, even tho' in itſelf it was not held unclean. If there were no other Meaning in it than to avoid, as much as poſſible, any kind of Cruelty in giving them Pain at their Deaths, and highly to be applauded by every human Breaſt.

* The other Uſes of the Nails are, 1*ſt*, to add Strength to the Fingers and Toes, ſerving, as *Fulcra*, to reſiſt the forcible Preſſure of any Thing we handle roughly, or tread upon with Force; for, if it were not for theſe, the Fleſh of the Extremity of the Fingers and Toes would be often painfully driven backwards, even to endanger the Bones forcing them-ſelves

ſomething ſtrong and hard was neceſſary for their Defence; wherefore the perfect Organizations of theſe horny Bodies, Subſtances which differ greatly from that of any other Parts of the Animal, are placed at their Extremities, with a Capacity of puſhing forth new ones again, after the old ones are deſtroyed. The ſame may be ſaid of the Hairs and Feathers of every Animal, which tho' pulled out by the Roots intirely, there yet remain Organizations to produce more ſucceeding ones *.

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ſelves thro' the Skin, in ſeveral Actions we are ſometimes engaged in; 2*dly*, to allay Itching in any Part of the Body; and 3*dly*, to ſerve as Ornaments, for without them the Fingers and Toes would look like ſo many unſeemly Stumps.

* The Hairs and Feathers of ſome Animals fall off annually, and are gradually replaced by others from latent Organizations; which probably may have given the Hint to that avaritious Cuſtom of ſtripping the Geeſe quite naked alive once a Year, which prevails in many Parts of this Kingdom; a Practice no leſs irrational than cruel. The towering Horns of

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Are not the Teeth, alſo, ſo many ſubordinate Organizations, diſtinct and ſeparate from the Subſtance of the Jaw, placed there for our Uſe? We know they are not Proceſſes of the Jaws in which they are placed, nor *Epiphyſes* of any Kind; but ſmall Grains depoſited, two in each *Alveolus*, and each ſeparately proceeding from and depending at the Extremities of the moſt minute nervous Twig, with a Vein and Artery for its Nouriſhment and Senſation, which are viſible in the Sockets of the Jaws of Infants, who die about the Time of Dentition; one of theſe takes Place of the other, being now more mature, and grows till it has forced its Way through

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the Deer Kinds, which are ſhed annually, are ſucceeded by others ariſing from the ſame Principles; as well as the Spikes or Quills of Animals, which Nature has provided them for their Defence; for, whether theſe are annual or perennial, whenever they accidentally fall off, they are in like Manner replaced by others from their proper Organizations.

the Gum, but, its Organization being limited to a certain Size *, it comes to its utmoſt Growth; and, the Jaw ſtill growing naturally larger, of Courſe the Sockets grow too wide for theſe firſt Teeth, whence they become looſe and fall out; this is the Reaſon why Children are ſhedding their Teeth from about the ſixth or ſeventh Year of their Age, till about ten or twelve Years old, ſooner or later. To every Tooth the ſecond ſucceeds, which, having a Capacity in its Organization of growing to a

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[*] There is a young Gentleman of my Acquaintance, who has had two Sets of Teeth ſucceed to the firſt, before he was twenty-one Years of Age; which ſhews that there are commonly more Organizations than two in each Socket, deſtined for our Uſe, which are ready to grow out upon the Loſs of the former; for it is Preſſure alone that keeps the ſubordinate Teeth from growing, which being taken off, Nouriſhment is ſent to the new one, that is firſt prepared to receive it, and it is gradually increaſed and protruded to its utmoſt Growth.

greater Size, * becomes large enough to fill the Socket on every Side, and ſufficient to

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* This wonderful Ordination of a Capacity in the ſecond Organization of growing larger than the former, brings to my View an Object, where the Caſe is manifeſtly of the ſame Nature, and which will ſerve to illuſtrate this in a very clear Manner: The firſt Year's Growth of the Horns of a Male-Deer conſiſts only of one Shoot, without what Sportſmen call *Brow-Antlers*, which a natural Hiſtorian would call Anterior Proceſſes; theſe are ſhed or caſt off at the uſual Time; he is call'd a *Fawn* during his firſt Year, and, when his Horns begin to grow, which is at the Beginning of his ſecond Year, he then has the Name *Pricket*; this Year produces the firſt Shoot juſt mentioned; his third Year intitles him to the Name *Sorel*, when his *Antlers* appear and grow to their full Size; in his fourth Year he is call'd a *Sore*, when his Horns are yet larger, having other Ramifications more than thoſe of the Year before; in his fifth Year he is call'd a *Buck of the firſt Head*, having his Horns ſtill more branched, and palmed; and, when he is in his ſixth Year, he is a *Great Buck*. Now here is a plain

to ſerve us the Remainder of our Lives; but theſe are not always limited to two, for

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plain Proof, that the firſt Year's Horns had no Capacity of growing larger, and, therefore, as they were not ſufficient for his Defence, theſe muſt drop off of Courſe; and alſo, becauſe it is providentially ordain'd that every other ſucceeding Pair ſhould be proportion'd in their Size and Weight to his gradual Increaſe of Strength yearly. Now the ſame Decay of the fibroſe Roots of his Horns, when he is a great Buck, is ſtill annually carried on, and conſequently, they cannot ſubſiſt nor remain on any longer; juſt ſo it is with Fruits and Leaves; when they come to a due Maturity, their Pedicles gradually ceaſe to tranſmit any more Nutrition to the Fruits, becauſe they are ordain'd to loſe their own, by the Decay of their own Veſſels at that very Time, and they wither, dry, and decay, the Fruit grows too heavy to be ſuſtain'd any longer, and at length drops; as the Leaf alſo does, as well by its own Weight, as by the Agitation of Winds, which, while the Pedicle was green, flouriſhing, and ſupple, was not ſufficient to diſplace it. But, altho' this is the Caſe for we have many Inſtances of Perſons, who, at a very advanced Age, have cut new

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Caſe in theſe Creatures, yet, in others, there is a Difference, which by the Way regards not the Uniformity of this Mechaniſm, but only the Duration; for Inſtance, ſome Animals carry the ſame Horns from the Beginning to the End of their Lives; and ſo ſome Trees are ever green, that is, whoſe Leaves do not annually fall off, but continue Years, having their Pedicles capable of receiving Supplies of Nouriſhment themſelves, and of tranſmitting the proper Juices to the Leaves they ſupport. Now this, as well as every other Phænomenon before-mention'd, is wonderful on many Accounts, and clearly proves that the utmoſt Growth of all Bodies, Animal or Vegetable, is limited to a certain Standard, beyond which it cannot grow; the firſt Teeth of Infants fall from their Sockets, becauſe they cannot grow larger, while the Sockets themſelves are growing on in Proportion to the other Parts; and yet the Growth of the ſecond Teeth is deſtined to go on ſo faſt as to overtake the Sockets, and ſo great as to fill them in a very little Time; ſo, in the Deer Kinds, the laſt and largeſt new Sets of Teeth, from other Organizations yet remaining in the Sockets, when their Lives have been protracted beyond the uſual Courſe of Years. Are not theſe ſubordinate Organizations, and this another Inſtance of the Benevolence of the great CREATOR?

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largeſt Horns at their full Size take up no more Time in growing than the firſt, which conſiſts but of one Shoot. It is meer Accident that prevents a third regular Set of Teeth in every Perſon, for there are Organizations for them in all, but ſeveral Cauſes ſerve to prevent them; as acrimonious Humours about the Gums, from the Blood, which fall on them, Neglect of the Mouth, a Diſpoſition of the Sides of the Sockets to fall in with each other, when a Tooth is loſt, ſhutting it up, and both together acquiring an Edge, which prevents another to ſucceed by meer Compreſſion; but in the other Tribes of Animals there ſeems to be no Occaſion for ſecondary Teeth, becauſe the firſt Set is more than ſufficient to ſerve them during their Lives, which are generally of a very ſhort Duration, few of them being protracted to half the Time which their Teeth would eaſily ſerve them.

We cannot avoid remembering here alſo the ſurpriſing *Phænomena* of the Crab, which we were lately inform'd of by our curious and worthy Friend Mr. *Peter Collinſon*, in a Paper read before the learned Royal Society; which ſets forth, that when the Claws are bruiſed or otherwiſe injured, the Crab is capable of throwing off the injured Limb, to which another ſucceeds in due Time. I have repeated the ſame Experiment upon both *Crabs* and *Lobſters*, and found every Particular of that Gentleman's Account to be true in both; which engaged me to make further Obſervations on the Reaſons * for placing ſuch a ſurpriſing Power in theſe Creatures, and the Mechaniſm of the Parts which are the Subjects of theſe Remarks. I find then, that, if any Part of a Limb in theſe Animals be injured, there would be a

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* As in the Diſpenſations of Providence there appears nothing whatſoever in the moſt ſeemingly inſignificant Part of the Creation, that, upon due Conſideration, does not from itſelf point out a Reaſon, founded always upon the Neceſſity of the general Good of the particular Object; ſo, in this before us, the Reaſon will be manifeſt from regarding only what are known Facts every Day. In thoſe Places where theſe Creatures aſſemble, they

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they are obſerv'd to be very contentious and quarrelſome among one another, and, having no other Manner of attacking each other, they lay hold of each other's Claws, and are content with ſqueezing and confining one another without ceaſing: ſo that whether a large and ſtrong Crab is held by a ſmaller and weaker, which he is capable of dragging about with him; or tho' it were the Limb of a weaker confin'd by a ſtronger; neither can extricate himſelf, but by ſhaking off the Limb and leaving it with his Enemy. It was therefore abſolutely neceſſary to give them this Power, and that without having any Injury done to their general Conſtitution at the ſame Time; for they aſſemble in vaſt Numbers together, and ſo frequently and obſtinately lay hold on one another, that they would be hindered from feeding and other Functions neceſſary to preſerve and propagate their Species, to the general Detriment of the Purpoſe for which they were intended.

ſpeedy Mortification * of the Part, and conſequently inevitable Deſtruction of the Creature; and as they are more frequently ſubject among one another to theſe Accidents, than moſt others whatſoever, there was a Neceſſity for allowing them, in the Oeconomy of the World, this

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* The Circulation of the Fluids in theſe kind of Animals is known to be very ſlow, eſpecially in the Extremities; and as the Capacities of the Veſſels is greater here, than at the Going off of the Limb from the Body, the Fluids, upon the leaſt Injury done to the Limb, would immediately ſtagnate, and, from the Ingreſs of the Air into the injured Part, produce ſo acrimonious a Ferment, as to be capable of deſtroying the Creature very ſpeedily; which any one may eaſily perceive, who either taſtes or ſmells the Fleſh of a Crab or Lobſter, when it is in a putrid State; for, perhaps, there is not a more acrimonious Putrefaction, than is produced in theſe Creatures. Now, theſe were Reaſons ſufficient for creating them with the Power mention'd, and therefore the moſt convenient mechanical Form was neceſſary in their Structure to admit of thoſe Changes for the general Good of the Whole.

wonderful Power of Casting off the Limbs either when it is injur'd, and of repairing their Losses, and thus preserving themselves for the Uses we make of them.

Accordingly in every Limb, near the Body, between two of the Articulations, there is a kind of Seam or Suture, which makes that Part more tender and weak than any other. Here it is the Animal breaks it off, and in no other Place; and here also it is that the Organization of the succeeding Limb is placed, in order to succeed the former immediately and gradually, after it is cast off: for, if the [illegible] in the more considerable Parts of the Limb, which are always largeſt towards the Extremity, either in the Claws or between Articulations, were deſtroy'd, the Extravasation of Juices or other Accidents would inevitably prove fatal, if this Power of throwing it off was not in the Creature; and the Reason, why there can be no Harm from their Separation in the Part above-mention'd, is, that here there is a Stricture on every one of the Veſſels that goes on to the Extremities, and a Capacity of their pursing up and inſtantly cicatrizing, whilſt the Juices are protruded, with the ſame Velocity, and in the ſame Quantity, as before, to this as well as to the other Limbs, and, being ſtopp'd by the ſudden Conſtriction * of thoſe

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* Who can ſufficiently admire the wonderful Contrivance, and its Convenience in placing theſe Organizations, and the Seam which is the Place of the injured Limb's breaking off, in this narrow Part, and ſo near the Body of the Animal? If they were in a larger Part of the Limb, what a putrid State would the fractured Part and the Fleſh of the Creature in it acquire, and what a Length of Time muſt it endure it, whilſt the ſubordinate Organization grows to be of Uſe and to fill it up? But it is wiſely placed in the moſt ſlender Part of the whole Limb, where there is no ſufficient Quantity of Fleſh to corrupt, or even to ſuppurate in any Reſpect, and where the Stricture of the Veſſels happens the Moment the Limb is off; and in fine, where in a very ſhort Time the Organization buds out of the little broken Cylinder, and immediately fills it up, uniting with it, and excluding any Particles that might be carried in by the Air, to the Detriment

thoſe Veſſels, they are wholly determined to the ſubordinate Organization, by its own proper Veſſels, and conduce to begin its Explication and Extruſion, and, at length, to compleat the Limb by the common Laws of Circulation and Accretion, as it is before plainly proved concerning Vegetables.

From this we may now, I think, and not unſeaſonably, caſt our Eyes on that Creature, which, a few Years ago, employ'd the Attention of many of the learn'd, here, in *France*, and in *Holland*; I mean the *Polypus*, whoſe Power of multiplying itſelf, by being cut in Pieces, the indefatigable Monſieur *Trembley* was ſo happy as to diſcover; and which was after-

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ment of the Progreſs of the new Limb. But, what is farther amazing, the Inſtant the Limb is off, the only Extravaſation that happens is a whitiſh *Mucus*, which is of the utmoſt Uſe and Conſequence; for it ſerves to keep the Air out, until the Rudiments of the ſubordinate Limb are large enough to break through this *Mucus* and fill up the broken Place.

wards verified here, firſt by our learn'd Preſident *Martin Folkes*, Eſq; of which there is an Account printed in Number 469, Page 422, *of the Tranſactions*, and afterwards by Mr. *Henry Baker* in a great Variety of Experiments which are ſpecified in his Book upon that Animal throughout.

If we conſider this Creature maturely, I believe, we ſhall hardly find any Difference between it and thoſe other Parts of the Creation juſt mention'd, either as to what regards the Care of the Almighty in its Preſervation, or the *Analogy* and *Uniformity* of their Conſtruction and Organization. Here are indeed two Ways by which this Animal is propagated; the firſt is by the *Extruſion* of the *Fœtus* from the Sides of the Parent, and the other is by *Cuttings* of the Animal itſelf. My Buſineſs here is not to enquire whether there is any *Coitus* between them, nor do I think it at all neceſſary to my preſent Purpoſe; for the Facts before us will be ſufficient to found any Opinion upon, that may ſeem beſt to illuſtrate the Subject, which I am at preſent endeavour-

[illegible] [illegible] [illegible]. [illegible] as I think there [illegible] [illegible] [illegible] [illegible] consider, in this Place; [illegible] [illegible] Management causes them [illegible] [illegible] [illegible] [illegible] than ordinary, at [illegible] [illegible] Times; for all which I [illegible] [illegible] [illegible] [illegible] the Observations of [illegible] [illegible] who made Experiments [illegible] [illegible] Time to Time.

[illegible] [illegible] [illegible] [illegible] them in all Respects, that [illegible] [illegible] [illegible] [illegible] Organization [illegible] [illegible] [illegible] every-where in this [illegible] to answer all the Ends of the [illegible] [illegible], for the Preservation and [illegible] of this Species of Animal, [illegible] well as of others capable of the same Manner of Propagation, by being [illegible] [illegible] [illegible]? What but such a Mechanism as this could answer those Ends, [illegible] [illegible] [illegible] that Analogy and Uniformity [illegible] [illegible], which are every-where [illegible] [illegible] manifestly [illegible] in the Animal and Vegetable [illegible]?

Let us, however, [illegible] view this Animal in its Progress together with a young *Viper*; and then the *Analogy*, I am contending for, will be more clearly underſtood; for Example, the young *Willow* is an intire organiz'd Body in itſelf, capable of growing larger till it is come to its perfect Growth, by Means of the Vegetative Principle; the *Polypus* is alſo a perfect organiz'd Body in itſelf, and capable of being extended and growing larger, till it is come to its perfect Growth, and of Feeding and Loco-motion, by Means of its *animating Principle* *. The *Willow*, as it grows, is gradually ſending off new Branches, which are its *Fetuſes*, proceeding from the Organizations I have mentioned before, each of which being capable of having its other ſecondary Organizations, to be produced in due Time: The Parent, in like Manner, is gradually ſending off its *Fetuſes*, which alſo no Doubt proceed from ſecondary Organizations, placed by Providence in its Sides for that Purpoſe, each *Fetus* being, in like Manner, *capable* of having its other ſecondary Organizations, to be produced in due Time. The *Willow*, when cut in Pieces and planted, each Piece, provided it contains any of these Organizations, will be expanded into a Tree like its perfect Parent, and in its Progreſs extrude its Fetuſes, &c. as before; the *Polypus* alſo, when cut in Pieces, each Piece having its Organizations, one of them will firſt take Place, expand itſelf, and in its

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* This is the firſt Time that Mention is made of the *animating Principle*; hereafter it will be frequently mention'd, according to the Nature of the Subject, as it goes on; the *Soul* has been a Subject treated of by many Philoſophers, ſeveral have pretended to define it, ſome to deſcribe its Subſtance, and, in a Word, many have endeavoured to ſay what it really is in itſelf. For my Part, I fairly renounce every Attempt to explain either its Nature or Connexion with the Body. I am content with my Confidence that I have a reaſoning Faculty within myſelf, of which, together with my viſible Organization, I am compoſed and conſtituted; and ſo I think of every other Animal with Reſpect to its Loco-motion, and other Functions which muſt be

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be the Reſult of an animating and moving Principle. That it is, we muſt know from innumerable convincing Reaſons; but, *what* it is, He only knows who gave it Being.

Progreſs ſend off its *Fœtuſes* alſo in due Time. Thus may a *Tree* or *Plant* be propagated to produce innumerable Trees or Plants, and thus may a *Polypus* be the Parent of innumerable *Polypi.* So that Cutting a *Polypus* in Pieces is but Anticipating the Propagation of thoſe very Organizations, in the Pieces, which would, if let alone for a While, themſelves iſſue forth of the Sides of the Parent in due Time; and this is the Caſe of a Twig or Branch, having a certain Number of Organizations, which, if let alone, would extrude them of themſelves, tho' not in ſo ſhort a Time, as if cut off and planted.

Can this *Analogy* of Organization be doubted any longer, or can there be the leaſt Room for making any other Diſtinction between them, than what is to be conſidered with Regard to the *Animal* and the *Vegetable?* This, not being capable of ſubſiſting in its ſeveral Proceſſes, in any wiſe, without being fixed to, or in Contact with, ſomething which affords it conſtant Vegetative Nutrition; that, ſubſiſting in itſelf, by Means of its *animating Principle,*

Principle, which, together with its Structure, qualifies it for receiving Food for its Nutrition, and for Loco-motion?

The *Polypus* would ſeem a very inſignificant Creature, to thoſe whoſe Views of Nature's Works are not extenſive enough, and who cannot ſpare Time to diſcern with due Attention, and Admiration, the Beauties and Perfections of every Part of the Creation; but this great Proviſion of ſecondary Organizations ſhews they are not ſo inconſiderable in the Eyes of their CREATOR, as to ſome Men who may imagine them not worth Notice; for, if we only obſerve their extreme Tenderneſs, which expoſes them to be wounded, nay, torn to Pieces, by any hard Body, tho' never ſo ſmall, carry'd down the Streams, or moved in the Ponds, in which they dwell, we may eaſily ſee the providential Reaſon for placing Organizations everywhere for their Reſtoration and further Propagation; for perhaps, there is no other Animal of ſo tender a Texture, and conſequently ſo eaſily deſtroy'd; having neither Sagacity to avoid Danger, nor Strength to reſiſt or bear the leaſt Injury.

Indeed, the ſame Power is alſo apparent in ſome Kinds of Worms, and in all the Kinds of the Star-fiſh *; which has been proved

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* Which appears to be verified in a curious Abſtract, made by our worthy Preſident, of what is contain'd in the Preface to the ſixth Volume of Monſieur *Reaumur*'s *Hiſtory of Inſects*, relating to ſome of Mr. *Trembly*'s firſt Obſervations upon the *Polypus* delivered in to the *Royal Society*; Part of which I have tranſcribed, as the Facts are intereſting and curious, as follows:

" Theſe Experiments were no ſooner
" known among the Curious in *France*, but
" it was preſently imagined, theſe Inſects
" were not the only Species to which Nature
" had given ſo extraordinary a Faculty: And
" numberleſs Obſervations were made for
" that Purpoſe. Monſieur *Bonnet* was not
" long before he found a very ſlender Water-
" Worm of about an Inch and half long,
" that had the ſame Property; and Monſieur
" *Lyonett* diſcovered another above three
" Inches long, and of the Thickneſs of the
" treble String of a Violin, that, being cut
" into 30 and 40 Parts, afforded the ſame
" *Phænomena*.

proved too by Experiments, and can be ſo only for the ſame Reaſon, their being very liable to Danger and Deſtruction.

Every

“ *Phænomena.* Monſieur *Reaumur* was deſirous, if poſſible, to ſee the Succeſs of theſe Experiments in ſome Animals of a larger Size, and inclined to believe ſome Sea Productions, not very unlike in Shape to theſe freſh Water ones, together with other Bodies among thoſe diſtinguiſhed by the Name of *Urticæ marinæ*, and Star-Fiſh, might not improbably be endow'd with the like Faculties; he engaged Monſieur *Guettard* and Monſieur *de Juſſieu* to be aſſiſtant in making Variety of Experiments, by the Sea-Side, on theſe ſeveral Sorts of Bodies; the firſt was on the Coaſt of *Poictou*, the other on that of *Normandy*; and they were ſoon ſufficiently ſatisfied, the ſame Laws of Nature had Place in theſe Sorts of Animals alſo. Many of the Star-Fiſh Kinds particularly, and which uſually conſiſt of five equal *Radii* or Arms, were found wanting, ſome one, others two, three, or four, of thoſe *Radii*; and Nature was reproducing in them the *Radii* wanting. Monſieur *Juſſieu* broke and cut

“ Star-

Every Creature has ſome Mark or other of his Maker's Care; let us therefore

Mr.

“ Star-Fiſh into ſeveral Parts: He had the
“ Pleaſure to ſee thoſe ſeveral Parts continue
“ alive, and to obſerve their Wounds
“ to cicatriſe and heal, tho' he could not
“ ſtay long enough in the Country to ſee
“ the new Parts break out in the Room of
“ thoſe he had cut away; which has been
“ however ſupply'd by Monſieur *Girard de*
“ *Villars*, who, on the Coaſts near *Rochelle*,
“ has ſeen the *Urticæ* reproduce all that had
“ been cut off, and the Parts of the Stars
“ alſo putting out new *Radii*, in the Room
“ of thoſe he had deprived them of.
“ Monſieur *Juſſieu* alſo reported that this
“ Fact in the Star-Fiſh, ſo new to him, was
“ not ſo to the common Fiſhermen of the
“ Country, who, ſeeing him tearing and cutting
“ to Pieces one of theſe Animals,
“ told him, *Qu'il auroit beau faire, qu'il*
“ *ne parviendroit pas a leur oter la vie:* Thoſe
“ poor People having been accuſtomed to
“ ſee daily a Fact, the more Philoſophical
“ Part of Men had never ſo much as
“ heard of.”

[illegible] examine, why have not larger Animals [illegible] Organizations as might [illegible] other *Fœtus's*, or ſuch ſubordinate Organizations as might be explicated into [illegible] thoſe cut off at any [illegible] This is eaſily anſwer'd; it is becauſe that larger Animal, as I have hinted [illegible] but of *one only perfect* [illegible] which grows to its utmoſt

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[illegible] experienced the [illegible] Worms; and, as to the [illegible] one of them [illegible] an Arm, whoſe [illegible] was [illegible] a conſiderable [illegible] of Fiſhermen con[illegible] their Manner of [illegible] common Obſervation [illegible] Oyſters are lying [illegible] goes to prey upon them; [illegible] Oyſter perceives himſelf [illegible] Shells, laying hold on and [illegible] one or more Arms, as they happen to be within the Power of the Shells, and [illegible] the Creature [illegible], who has no other Means of extricating himſelf from his Confinement, but by breaking off the Arm, and leaving it behind him, to which a new one very ſoon ſucceeds.

perfect Form in itſelf, and is moved by *one only animating Principle*; but there was no Need of ſecondary Organizations for theſe, becauſe they are made advantageouſly, for avoiding and reſiſting Dangers, for Duration, and, in their own Lives, for propagating their Species many Times; for, if ſuch *durable* Animals had any ſecondary Organizations for their further Propagation, they would become too numerous for the World to hold them, and, therefore, muſt prove a Nuſance, rather than uſeful, in the preſent Oeconomy of the World; and the Want of ſubordinate ones is amply recompenſed, in the Portion of Sagacity allotted them for their Preſervation.

Since then no more than one Organization is proper to any one of the larger Animals, it would ſeem very abſurd to ſuppoſe any more than one animating Principle to each Organization; and, that there is one, I believe, cannot be deny'd me; and, again, it would alſo be abſurd to ſuppoſe this Organization capable of being properly and naturally actuated or influenced by the animating Principle, without being altogether a moſt perfect Organization of its Kind; which will very clearly appear, if we do but attend a little to the monſtrous *Proles* of Animals, which, by ſuch Imperfections in the general Organization as often happen, are daily known to periſh ſooner or later, according as they approach to the perfect or imperfect State of the Parent, without ever being able to arrive at the natural Degree of Perfection proper to their Species.

One would alſo hence be led to think this animating Principle cannot be divided in any wiſe; becauſe, if the moſt perfect * *primary organiz'd Animal* is cut in two, ſo as that its principal Parts are intimately divided, neither Part can ſubſiſt and live a Moment. And again, becauſe, when an Amputation of a Limb is made, that Limb being only the remote Extremity of this primary Organization, and conſequently very imperfect in itſelf, it inſtantly periſhes, whilſt the animating Principle is left behind to inhabit the Organization, yet perfect enough for its Dwelling-place.

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* Every one of the larger Tribes of Animals may be properly call'd a *primary organiz'd Animal*, that is, perfectly form'd in every Reſpect at firſt, without either a Neceſſity for, or any Title to, a *ſecondary* Organization. An Explanation of this Matter here is call'd for, that this Part of our Thoughts may be render'd the more clear; for the following

From what has been ſaid, it is eaſy to conclude that every ſecondary Organization in the *Polypus* has its *diſtinct* and *peculiar* animating Principle to attend it, which in due Time, according to the Capacity of the Organization to Motion, it actuates and influences in every neceſſary Manner, either in the extruded *Fœtuſes*, or in the reſtorable Pieces of the Parent; and hence it is plainly proved,

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lowing Paragraphs of this Chapter will amount to the *Sum* of our Explanation of the Reaſons, why the divided Pieces of the *Polypus* grow into intire and perfect *Polypi.*

there can be no Manner of Room for concluding, that, becauſe the *Polypus* is capable of being divided, and its Parts live, an animating Principle is capable of being divided alſo; but that would indeed be the Caſe in this Animal, if it conſiſted but of one *primary* Organization, and its ſeparated Morſels could live; and ſo it would in every large Animal whatſoever, which we ſee really conſiſts but of one perfect Organization; but, ſince no Pieces ſeparated from larger Animals can live, for Want of *ſecondary* Organizations, and their *animating Principles*, ſo neither could any Part of the *Polypus* live, after being cut off, if it had not ſecondary Organizations, each poſſeſs'd of, and influenced by, its own *diſtinct* animating Principle. Thus I think it is undeniably evident and clear, that no human Means can divide or deſtroy the animating Principle; that the Organization alone, whoſe groſs Parts are ſuited to the other groſs Parts of this World, is capable of being deranged, divided, and deſtroy'd, whilſt the animating Principle is as far out of the Power of being injured by us, as its Subſtance and Nature is beyond our Conception; ſince then it cannot be deſtroy'd here, it is very natural to think it continues to exiſt hereafter.

Let us now enquire a little what are the Advantages allow'd by Providence to Man, inſtead of ſuch ſecondary and ſubordinate Organizations as are proper to other Animals; and theſe are many and great; and, as the Preſervation and Welfare of his Creatures here ſeem to have been the principal Care of the ALMIGHTY, *Man* is moſt evidently the Favourite of his Maker; which ſhines forth in the ſeveral noble Qualifications allotted him, ſome of which we ſhall enumerate in the following Remarks.

Let us take a View of his Form, which I believe none will venture to deny to be the moſt perfect and noble of the whole Creation; it is given him to walk upright with an Air of Majeſty, as if it was decreed he ſhould be above and overlook the Whole.— He has a ſufficient Length of Days * to ſee moſt other Creatures grow old before him, and Generation after Generation ſpring from him, even whilſt he is yet able to take Pleaſure in them; producing thus Supplies

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* The Longevity of *Man* is ſo great an Advantage, that it never can be ſufficiently acknowledged; ſince it appears how neceſſary it was to human Nature, as to what regards the Weaning, and Bringing up, of Children. The Offspring of every other Animal requires but a very ſhort Time, to render it capable of providing and ſhifting for itſelf; whilſt that of Man remains helpleſs and tender, even to the Time that another Animal, of equal Age, is in its Prime and Vigour; and when theſe are paſt their Vigour, and are enfeebled through what, in them, may be accounted old Age, the Children of Men are even then ſcarce capable of doing aught to aſſiſt themſelves. How few do we ſee in our Times, having even paſt the twentieth Year of their Age, an Age of Decrepitude to other Animals, whoſe common Actions of Life do not yet confine them to the Infant Claſs of their own Species, when they ſhould be expected to have changed that, at leaſt, to the Degree of Adoleſcency with a little Sagacity?

for Age and the Grave, without any ſuch ſecondary Helps, as we have ſhewn to be needful for other Creatures. — He is ſtrongly made, which renders him capable of enduring Hardſhips and Injuries, during the whole Courſe of his Life, as much as any other of the Creation; and, where, at any Time, his Hardineſs and Strength of Body happen not to be ſufficient for his Safety, he has yet a more noble Reſource in his animating Principle, his *Forecaſt* and *Judgment*, which enable him to overcome Dangers and Difficulties, and ſecure himſelf with more Certainty than even the Strength of Elephants could procure him; whereby he is able to ſubdue all other Creatures, tho' never ſo fierce, ſavage, and ſtrong, and render them ſubſervient to his Uſe with great Eaſe; they are incapable of diſcerning the leaſt Part of his Deſign.— Man is capable of communicating his Thoughts to Society by the Utterance of his Voice, which, according as it is ſuggeſted and modified, is capable of influencing every Paſſion in his Hearers, that can fill the human Breaſt. Other Animals have only an inarticulate Noiſe, which, for the moſt

Part, is offenſive to Mankind, except in ſome of the winged Tribe, and which, in them, is at beſt but limited and uncertain;—they are incapable of pointing out their Neceſſities or telling their Ailments, and often remain overwhelmed in Miſeries that human Prudence would very eaſily avoid or ſhake off.—Other Animals are limited into a narrow Compaſs of Choice, and that little they have chiefly regards the Inſtinct to their natural Food, allow'd them together with ſome other little Advantages for their Self-preſervation. Man has a Free-Will to chuſe not only thoſe Things neceſſary for him, but has alſo a Power of diverſifying his Choice of either Food or Raiment, to almoſt an infinite Variety, of compounding and altering the very Guſt of his Food; and, in a Word, by this Power of chuſing, to promote and increaſe his Happineſs, even in this Life, if his Choice was not often too haſtily depraved, by his ill-timed Paſſions and Appetites.—Other Animals can acquire no Knowledge, and are only capable of an aukward Imitation of certain trivial Geſtures;

tures; Man is capable of increaſing and refining his Knowledge by Application and Study, of penetrating into the Secrets of Nature, and of reflecting back Praiſes and Adoration to the Maker of all Things.

CHAP. VI.

Conſiderations on the further great Happineſs of Man, in his Title to a Future State; *and of the* Conditions *of that Happineſs; wherein the true* Source *of the* Moral Law *is attempted to be explained.*

FROM the foregoing Reflections, it muſt be allow'd by the moſt obdurate and ſtubborn Minds, that, thro' all the Parts of Nature we have mention'd, there appears a moſt benevolent Intention in the Providence of GOD, for Man's Preſervation and Comfort in this Life; that theſe Proviſions can ſerve for no other Purpoſe; that whatſoever the Reaſon was for the Creation of Man, for giving Exiſtence to him, it is undeniably plain, that *Being* was alſo given to numberleſs Things for his Convenience and Support at the ſame Time; the Earth and Waters adminiſtering to him his Food and Raiment,

ment, both Animal and Vegetable, produced for him in various Manners, and preſerved for him in due Seaſons, as we every Day ſee them; and, in the Midſt of the Enjoyments of theſe Things, that others yet of a more ſublime Nature are in him, his Power of contemplating upon the Goodneſs of his Maker in the Creation of all theſe Things; and of raiſing his animating Principle to wiſh for, and and hanker after, ſomething above and beyond them all.

However, it may perhaps be objected by ſome, that my Treating of the animating Principle in ſo general a Manner, might ſeem as if I was inclined to ſet the Human, and other Animals upon too equal a Footing, eſpecially as it would alſo ſeem, I imagine it to be ſomething diſtinct from the Organization of every Animal *. As to this Matter, I leave every

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* When I ſee, and contemplate upon, the ſeveral Actions and Deſigns of my little *Dog*, who gives me much Pleaſure every Day, I profeſs it is impoſſible to avoid being

every one to think as he pleaſes, and frankly own, I had much rather that all
other

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ing amazed. His Paſſions are more quick than thoſe of many Men I have taken Notice of. There are ſome whoſe Joy or Grief at Accidents, give them ſo little Emotion, and are ſo dull, as to render it difficult to ſay which it is that affects them; but, in this honeſt Animal, both are lively and ſtrong. When any of my Family return Home, he ſhews great Gladneſs in his Careſſing and Skipping about them, and ſeems dull and concern'd at their going out; but there is one among them whom he diſtinguiſhes in a moſt particular Manner; when this Perſon goes Abroad, he is void of all Comfort and ſits in a Window, crying inceſſantly, refuſing Victuals, and watching for his Friend's Return, who is always welcomed by much Rejoicing and Noiſe. If he wants to go out of the Room, he puts his Fore-feet up againſt one of the Company, and, being taken Notice of, runs to the Door, riſing up againſt it in the ſame Manner, looking at the Perſon he gave Notice to before, till he is let out; if he wants Drink, he gives the ſame Notice, and immediately runs into a Cloſet, where ſtands
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other Animals ſhould be intitled to an *Eternity* with me, than that I ſhould be

diſſolved

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a Bottle of Water, continuing to run to and from the Perſon, till he is ſerved. Is not this Cogitation and Senſe? And can meer Body or Matter produce them, let its Motion or Modification be what it will? How can it be thought that any Animal is a meer *Automaton*, even tho' it differed from the Vegetable only in Loco-motion, which alone is enough to prove a *Volition* in the Creature; but, when ſuch Marks of Sagacity and Deſign appear, nothing but Bigotry and Stupidity could think ſuch were meer Machines. It was once a high Point of Religion to believe ſo, even againſt the Evidence of Senſe and Nature; and yet with Doctor *Bentley*, I cannot ſee that Religion can be in any Danger by this Opinion any more than the other, that is, whether they are annihilated or immortal: “The very Objection, ſays he, ſuppoſes the “Being of a God; and God can as eaſily “annihilate as create; or, if they be immor- “tal, what need we be concern'd about “it? 'Tis only by the good Pleaſure of “their Maker, who doth all Things for the “beſt. And, if they be bare *Engines* and

“ *Machines*,

diſſolved and annihilated with them. My Deſign in this Treatiſe is only to conſider its

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“ *Machines*, I admire and adore the Divine Artifice and Skill in ſuch a wonderful Contrivance; but I ſhall deny then, that they have any Reaſon or Senſe, if they be nothing but Matter. Omnipotence itſelf cannot create cogitative Body, and 'tis not any Imperfection in the Power of God, but an Incapacity in the Subject; the Ideas of Matter and Thought are abſolutely incompatible.—For none but beſotted Atheiſts do join the two Notions together, and believe Brutes to be rational or ſenſitive Machines. They are either the one or the other; either endued with Senſe, and ſome glimmering Rays of Reaſon from a higher Principle than Matter; or (as the *Carteſians* ſay) they are purely Body, devoid of all Senſation and Life; and, like the Idols of the *Gentiles*, they have Eyes, and ſee not; Ears, and hear not; Noſes, and ſmell not; they eat without Hunger, and drink without Thirſt, and howl without Pain.” But I would aſk thoſe Philoſophers a few Queſtions, Why are Brutes deſirous of the Coit, and what excites its Eternity and Separability in Man, and in the following Conſideration ſhew that, however that be, it is of no Conſequence to the Matter in Hand.

The bad Succeſs of Philoſophers, in endeavouring to find out Truths of this Nature, is certainly owing to the Narrowneſs of their own Ways of thinking, or Bigotry to ſome favourite religious Views about the Power of the God of all Things; and the Concluſions of ſome of them, being too haſtily drawn, have given Riſe to numberleſs Errors, in thoſe eſpe-

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cites them to it? Have they not Organs exactly ſimilar to thoſe of human Bodies for theſe Purpoſes? Is not the inſtrumental Uſe of them the ſame in all Reſpects? Is not the Offspring produced exactly in the ſame Manner? Why does my little Dog, juſt mention'd, remember and careſs a Friend whom he had not ſeen of two Years before; and why does he fly with Fury at a Man who ſtruck him a Year and half ago, who till now has been abſent ever ſince the Abuſe? And, in a Word, is Memory an Attribute of Matter either from its Motion or Modification?

cially who are rather implicit Swallowers of all Myſteries, than judicious Diſcuſſers of them, towards diſcovering the Truth. Some very ſhallow Concluſions relating to this Queſtion, whether Men and Brutes have, or have not, an Hereafter, Have been ſtrenuouſly held in ſome Degree or other through moſt Ages of the World, on both Sides of the Queſtion.

On one Side it has been laid down as a Thing granted, that Brutes are annihilated, when they die, and are of no further Account for ever after; and from thence they would infer, that becauſe Man is made of Fleſh and Blood like thoſe, and has a great Similarity with them in his organical Structure, and ſooner or later dies, he too ceaſes to be any more. On the other Hand, it has been maintain'd that Man has an Hereafter, and, becauſe Brutes have the ſame Structure and Similarity of Subſtance, they too muſt have an Hereafter. Theſe are the Notions of Men, who are voluntarily limited to ſingle Concluſions, without allowing themſelves the Liberty to make Diſtinctions, which the ſagacious Philoſopher will warily have

Recourſe to, before he faſtens the Knot of a definitive Concluſion, however ſpecious and alluring the Premiſſes may be. But they ought to conſider, that the great Being (whoſe Power is unlimited, whoſe Knowledge is boundleſs, whoſe viſible Works are infinite in Variety) might, if it were his Divine Pleaſure, make yet a greater Number and Variety, than there already is, in the Objects now before every obſervant Eye; and that, ſince the GOD of all Things has been pleaſed thus to make Man ſo much more perfect in every Reſpect than the Beaſts of the Field, as appears from the Compariſon I have all along carried on, was he not as able to beſtow on him an animating Principle as far ſuperior to that of other Creatures, as his Organization and majeſtic Form is to theirs? This moſt certainly cannot be denied. And indeed we are naturally led to think, that the animating Principle, even in Brutes, is diſtinct and ſeparable from their Organization, when theſe Conſiderations I am now to mention come before us: We ſee all Creatures that have Loco-motion are unqueſtionably organized Machines; that the Parts of any of theſe are capable of being moved or actuated; that no Part of ſuch Organizations could firſt move itſelf; hence that it muſt have ſome moving Power * connected with it continually, as long as it lives, which

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* Doctor *Bentley*, in his ſecond *Boylean* Sermon, intitled, *A Confutation of Atheiſm from the Faculties of the Soul*, endeavouring to prove, " that there is an immaterial Sub-" ſtance in us, which we call Soul and Spirit, " eſſentially diſtinct from our Bodies, lays " it down as ſelf-evident, that there is ſome-" thing in our Compoſition that thinks, and " comprehends, and reflects and deliberates, " determines and doubts, conſents and de-" nies; that wills and demurs, and reſolves, " and chuſes, and rejects; that receives va-" rious Senſations and Impreſſions from ex-" ternal Objects, and produces voluntary " Motions of ſeveral Parts of the Body. He " applies ſeveral natural and ingenious Ar-" guments to prove it: As that theſe Fa-" culties muſt proceed from ſomething or " other as their efficient Cauſe, meer nothing " being never able to produce any Thing " at all; and, that if theſe Powers of Cogi-" tation, Volition, and Senſation are neither " inherent

which moving Power, as ſoon as it is ſeparated from it, leaves it motionleſs and paſſive. An Arm or Leg, for Example, conſidered entirely, is compoſed of different Parts, ſome of which, the Muſcles, being the Inſtruments to move the Whole, by their Contraction, cannot be contracted without ſome impelling Power; and, as every Motion of an undiſeaſed Arm or Leg is really an Act influenced by Volition to anſwer ſome deſign'd End, that Volition muſt be previous to the Motion which is the Effect of that Volition, and in fine, that Volition is but the Faculty ariſing from the animating Principle which is that moving Power, we are confident, is in every Animal whatſoever.

" inherent in Matter, as ſuch, nor acquirable
" to Matter by any Motion and Modification of it (which he very undeniably
" proves by ſeveral Reflections) then it muſt
" neceſſarily follow, that they proceed from
" ſome *cogitative Subſtance*, ſome incorporeal
" Inhabitant within us.

This naturally leads us to fall upon the Difference between the animating Principle in Man, and that in other Creatures, by enumerating the Faculties, that appear to our Comprehenſion of them ſeverally, and making ſome Animadverſions on them; and, firſt, let us conſider the Faculties of the animating Principle in the Brute Creation.

Among the various Families of Animals we find different Degrees of Sagacity in them, according to the Places allotted them to live in, the Nature and Manner of acquiring their Food, their Defence from Enemies, or any other Neceſſities they may lie under. Some Claſſes of Animals have nothing more to boaſt of, as to a Senſe of Things, than the meer Vegetable fix'd to its native Place, nor have they any other Difference but bare Loco-motion; ſuch as the Tribes of the Star-fiſh, *Urticæ Marinæ*, ſhell'd Fiſh of all Kinds, the *Polypus*, and innumerable others we might readily mention; others have ſome ſmall Degree of Sagacity above theſe ſuited to their Offices in Life, as the ſeveral oviparous Inſects in general; next to theſe, the oviparous Tribe of the Air are happy in a little more Sagacity, which appears only in what regards their Duty of preſerving their Young, and bringing them up, to fulfil the Propagation of their Species; and, after all theſe, the viviparous Animals of the World ſeem to riſe higher, and have an animating Principle much more perfect than any of the others juſt taken Notice of; and yet, amongſt theſe, ſome Claſſes are much more docile than others, even to a Degree that, when conſidered maturely, is ſufficient to aſtoniſh the wiſeſt Philoſopher; here a new Scene ariſes, which is an amazing Inſtance of the Providence of God for the Proviſion of Mankind, and an undeniable Proof, that the other Creatures of the World were made for Man alone, whatever has been aſſerted to the contrary by any Authors; and it appears in this in general, that, of all the Beaſts of the Field, thoſe which are beſt ſuited to our Uſe are undoubtedly the leaſt ſagacious, or moſt gentle in their Natures, as well as moſt numerous, that they may be the more eaſily ſubdued, and habituated to bear what we every Day apply them to *; thus the Horſe, the Aſs, the Camel, the Rein-

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* There appears, according to ſome Opinions, to be a Neceſſity for inferior Orders of animating Principles in the World, upon this Suppoſition, that ſince many Species of Animals are deſtined for ours, as well as the Food and Nouriſhment of one another, 'twas neceſſary they ſhould be preſerved in great Numbers by ſome Means or other. What could be ſo ſure a Means, and what anſwer even this temporary End ſo well, as to create them with an animating Principle, and a Power of propagating their Species in a ſucceſſive Series, for the Proviſion of every ſucceſſive Race of Animals, for whoſe Uſe they were intended? And yet that theſe are an inferior Set of animating Principles cannot be poſitively proved, but only ſuppoſed, from the daily Deſtruction of them by the Slaughterer's Hand. In *Fez*, *Morocco*, and ſuch other Nations, the animating Principle of Man would ſeem altogether as inſignificant, if they were to be eſtimated according to the daily Slaughter and Deſtruction of them, by the Command of tyrannical

Rein-Deer, *&c.* are eaſily made to ſubmit their Necks to the Yoke, and bear our Burthens; whilſt the Ox, the Sheep, *&c.* are ignorant of their Fate, from the lifted up Arm that gives the fatal Blow; nay, the Elephant himſelf, however ſagacious, is more docile than wiſe, when he is ſo ſoon reduced to Obedience, and, from a very wild, to become a familiar domeſtic Creature.

But, ſuppoſing theſe were not fit for either Food or Service to Mankind, would not the Fate of Man be very hard? If only the Lion, Tyger, Fox, and ſuch like were proper Food, what an arduous Taſk would it be to obtain it in a ſufficient Quantity to anſwer our Ends, and how hazardous in the Purſuit?

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nical Governors. Nor is the Man, who is baſely murder'd, leſs intitled to an Hereafter, than he who lingers and dies away in his Bed. Indeed, leſs Sagacity in thoſe uſeful Animals was highly neceſſary, that our Trouble might be the leſs in ſubduing them.

When theſe Things are conſider'd, one would almoſt be naturally led to conceive Degrees of animating Principles, from that which is neareſt the Vegetable, in Lowneſs, up to that of Man: And yet, among all theſe, there is not a ſingle Inſtance, that can in the leaſt diſcover any Shew of Conſciouſneſs of moral Good or Evil *,

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* If it may be ſuppoſed that even the animating Principles of other Animals may be intitled to an Hereafter, it was ordain'd ſurely, that they who can do no Evil, ſhould have no ſeeming Knowledge, here, of either moral Good or Evil; they have no Charge extended to them here, have nothing to anſwer for, and are ſufficiently inſtructed, by their Maker, in the ſeveral Modes of preſerving themſelves, which is all that was wanting to them. The Bull, that gores a Man, does it only for Fear the Man ſhould gore or otherwiſe deſtroy him; for it is impoſſible to impute the Attack to Malice, or any other Motive but Self-preſervation; the Wolf or Tyger kills and eats a Man, as he would a Sheep, not at all thinking it more or leſs lawful to kill the one than the other, his Motive being Self-defence or Self-preſervation.

till we come to Man; nor can it be obſerv'd, that the moſt perfect of them can look any farther than to what regards its Self-preſervation, and that chiefly with Reſpect to his Food; we ſee none of them capable of diſtinguiſhing, nor taking any Pleaſure in, the beautiful Productions of the Fields or Foreſts around them, nor fixing their Attention on any Thing elſe, but the Herbage they are to feed on; their Views are limited to the narrow Compaſs of Paſture that ſurrounds them, nor do their Deſires reach any farther, by any Thing we can find; and, as it may be rationally concluded from this, that they are under an Inability to know any Thing of moral Good or Evil, ſo it muſt be allow'd they can be guilty * of

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* It would derogate from the Glory of the *Divine Being*, to imagine that there were not innumerable Claſſes of inferior Beings created for his Pleaſure, of different Degrees of Perfection in their animating Principles; and, if what certain Mythologiſts have thought concerning the Pre-exiſtence of the animating Principles and their Rebellion has any Foundation, then there

of no Evil; and, therefore, they can be conſcious of no more than Pain or Pleaſure in themſelves, which in them can only tend to one End, which is the only

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there would be ſome Reaſon for ſuppoſing that every Animal, of whatſoever Kind, and in whatſoever World among the Planetary Syſtems in the Univerſe, was confin'd to his preſent Form, State, and Organization, in order to ſuffer the due Puniſhments in that Confinement, and, at the ſame Time, to hold their Places in the Chain of Beings, for the Good of the Whole, in this State of Pilgrimage or Paſſage to another Condition. And then, if this was true, it would not ſeem irrational to ſuppoſe, that their ſeveral States here are final, as to Puniſhment; ſince they certainly cannot be guilty of any further Evil. Whereas, in Man, the Condition of his being able to render this a final State, as to Puniſhment, for former Diſobedience and Rebellion to his Maker, is his doing Good, and doing no Evil, ſince the free Will that is given him, makes him capable of doing either; for by the one he increaſes his *Guilt*, and by the other he expunges every previous Debt upon him, and merits future Happineſs.

Law they can have any Share in, their Self-preſervation; the Conſciouſneſs of Pleaſure prompting them to ſatiate themſelves with Food, and the great Work of Propagation; and the Conſciouſneſs of Pain to defend themſelves from Injuries, and not at all to commit any.

By linking theſe Reflections together, I cannot help thinking that this Conſciouſneſs of Pain and Pleaſure, which in other Creatures has only the Tendency to the firſt Law of Nature, is in Man the very Origin of the moral Law; and I believe it will appear ſo, by adding a few more Reflections which relate to the Nature of the animating Principle belonging to human Nature; and, altho' I have ſaid a good deal in one of my preceding Chapters to this Effect, yet, ſomething more is to be added, which will fully evince all I deſign to prove in this little Work.

There are certain Things, which I am inclin'd to think Man muſt neceſſarily and abſolutely know, without any Inſtruction at all, but purely from himſelf; which, if duly conſidered, will eaſily ſhew that the Origin of the Knowledge of moral Good and Evil is in himſelf, connected with his very Structure and Parts, ſo intimately blended with them, that it is impoſſible for him to ſhake it off; but which, if his animating Principle was not of a Divine Nature, immenſely ſuperior in its Attributes and Qualities to thoſe of all other Animals, as they appear here, could have no farther Tendency, than to preſerve himſelf like them: Let us, for example, ſuppoſe a Number of ſavage People in an Iſland remote from any Commerce with every other Nation whatſoever, untaught by any Precept, uninform'd and uncultivated by any Means, and unreſtrain'd by any temporal Laws whatſoever; every one of theſe muſt, by barely viewing himſelf, know.

1. That he exiſts, and that he did not make himſelf.

2. That others exiſt like himſelf.

3. That he is ſubject to ſuffer Pain, or capable of feeling Pain.

4. That he is capable of feeling Pleaſure.

5. That whatſoever gives him *Pleaſure* is naturally good and deſirable.

6. That whatſoever gives him *Pain* is naturally evil.

7. That the others like himſelf are ſubject to the ſame Paſſions.

8. That he ſometimes wants the Aſſiſtance of another.

9. That he is ſometimes able to give another Aſſiſtance.

10. That there is a mutual Satisfaction in ſuch reciprocal Aſſiſtance, whence ariſes Friendſhip.

11. That there is a mutual Diſſatisfaction, from the obſtinate Refuſal of ſuch Aſſiſtance, whence ariſes Hatred and Enmity.

Being thus naturally verſed, from his own Senſations in all theſe Things, would he not voluntarily *cheriſh* what he found *good* or *pleaſing*, and on the other Hand put away, or deſtroy, any thing that gave him *Pain* or *Trouble?* He ſurely would; and then it will neceſſarily follow, that he would have ſome natural *Reluctance* at giving another the Pain he would himſelf refuſe or ſhun, for the ſame Reaſon that

(Observation on the Analogy between the that he would have a natural *Compaſſion* and *Concern* for any of his Fellow-creatures in Pain or Trouble. Now, altho' other Animals are taught to preſerve themſelves in the Manner I have explain'd before, they cannot, by any Means, be taught to range their Concluſions one after another in due Order, as to be thus conſcious of Good or Evil towards others in this Life.

And that this Kind of Conſciouſneſs is peculiar to Man, will be render'd yet more incontestable, upon this Conſideration: It cannot be deny'd by any Man, we may be pretty confident (upon his being inclin'd, at any Time, to commit an Act, that is in itſelf a *moral Evil*) that he is *forbidden* by *ſomething* within himſelf to commit it; altho', perhaps, for Want of obeying that firſt Divine *Impulſe*,* there is a Con-a Conceſſion of the animating Principle which follows it, in Favour of the Organization, which is a ſenſual Sharer in the evil Gratification; and it becomes the Inſtrument of perpetrating the forbidden Crime, which, when it is paſt, is, in every Man, again ſucceeded by a *Reluctance* proceeding from the very ſame divine animating Principle, unhappily ſway'd before by the Proneneſs in the Organization to fall into Evil. What is it

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* If this *Impulſe* of the animating Principle was not an abſolute and a juſt Judge to one's ſelf, who would ever think of chuſing to commit a villainous or baſe Act in *Secret?* And why do they ever chuſe to do ſo,

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ſo, who give Way to Vice? Is it not, becauſe they are ſure from *within*, even without any other Precept, that their Intentions are *not righteous?* And what makes Cowards of the *Wicked*, but the conſtant *innate Accuſer*, which makes them afraid of every *Buſh* or *Shadow?* The immortal *Shakeſpear* thought well on an Occaſion like this, when he repreſents *Mackbeth* terrified at the Ghoſt; he puts the cowardly Murderer in a true Light, when he makes him cry out "*Thou can'ſt not* "*ſay I did it*"; how *abject*, how *mean*, did *he* make his *guilty ſelf?* Juſt ſo is every *vile* Fellow; he draws his *Diſgrace* out of *himſelf*, and cannot be at *Peace*.

then, that thus inſtantly ſhrinks, and is offended [*] within him upon ſuch Occaſions? Sure no Man will be ſo hardy as to aſſert that the *Principle* which firſt forbids the Evil, and the *Organization* that is the inſtrumental Perpetrator of it,are the ſame Thing? No, they are diſtinct and ſeparable Beings; and the animating Principle is offended for no other Reaſon, but becauſe, being of a Divine Nature, it is Truth itſelf, and cannot bear an Evil or Untruth, leſt the Divinity of it ſhould be degraded. How happy is the Man who is ſway'd by this Divine Influence, whenever it gives him Warning? Thus the Phyſical Law in Man may be ſaid to be the Source of the Moral Law; for from his very Senſations he finds a *Pabulum* for that great Faculty of his *animating Principle*, the Conſciouſneſs which is within him; and therefore every Man may be ſaid to be naturally conſcious of moral Good and Evil.

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[*] The poor obſtinate Criminal, who, after the cleareſt Evidence againſt him, ſtrongly perſiſts in, and avows, his Innocence for a Time, and the low Villain who bears falſe Witneſs againſt, or otherwiſe injures his Neighbour, are ſometimes on a ſudden prompted and compell'd by this very Principle within them, the one to confeſs his Guilt, and the other to retract his Teſtimony, or no Peace of Mind can come unto them. And, where it happens that the reprobate Condition of their Conſciences hinders Reflection and Repentance to come in the Way, what a State of Miſery muſt ſuch be in, in endeavouring to cover his Guilt, in the one, or even in the continued Gratification of *Envy* and *Malice* in the other? It is hard to conceive it as it is, and is beſt *felt* and known by the Miſcreants that make themſelves ſo unhappy.

That this Divine animating Principle in Man is, ſome Time or other, ſeparable from the Organization in which it dwells, will yet appear more certain, by conſidering its State in Infants, Idiots, *&c.* Shall it be ſaid, becauſe an Idiot has not Reaſon and Senſe like others, that his animating Principle is inferior to that of other Men? I am inclined to think, that both Infants and Idiots have them in the ſame Perfection with the moſt brilliant Philoſophers, Poets, or Orators in the World; however defective and incapable their Organizations may be render'd, during their Infancy, or by Accidents, either during their Confinement in the Womb, or in their Progreſs to Manhood, in different Men. GOD cannot be partial, but equally benevolent to all; the whole human Race is but one Order of intelligent Beings, each conſider'd, as to its animating Principle, equal to the other; the Viciſſitudes and Revolutions of our temporary Syſtem, which muſt neceſſarily ſubſiſt among us here, are the ſole Cauſes of the Difference between Man and Man in this Life; and every human Being, in his Progreſs here, is haſtening to arrive at that Degree of Perfection which brings all Men to their deſtin'd Equality, to that happy Perfection, which qualifies them to dwell with and adore their Maker with unſullied Minds and Intentions, with that Divine Liberty, and perfect Knowledge, which their interrupting Load, in this Life, had conſtantly hinder'd them to arrive at; and to which, for Reaſons only known to himſelf, he has allotted their Alliance, that they might endure the ſeveral Croſſes and Accidents the

Imperfection of their Conditions, here, neceſſarily ſubjects them to.

Let us take a View of the State of this animating Principle in Infants, and we ſhall find it greatly clogg'd and impeded, becauſe of the Imperfection of the Organization, which is now only capable of being aukwardly moved by it; and let us trace and follow him up to Manhood, and ſee how every Day's further Explication, and Improvement, gives the animating Principle more and more Power to rule thoſe Organs; until, in their utmoſt Perfection, not only the ſeveral Actions proper to Mankind, but alſo the Judgment and Reflection of the Divine animating Principle are exhibited in as much Perfection, as the Nature of the Organization can admit of; and altho' Idiots have Organizations which grow perfect enough for Loco-motion, and the other common Actions of Life; yet as every Senſation, is communicated to the animating Principle, by Means of certain peculiar Parts, ſo the Reſult of the Intellects cannot be exhibited from the animating Principle, but by certain peculiar Parts of the general Organization; and, if there be any accidental Defect in theſe peculiar Parts, then neither the Senſations on the one Hand, nor Underſtanding on the other, can be duly executed, and the Perſon muſt remain in a State of Inſenſibility or Idiotiſm, during Life; ſo that in this Caſe, as to what regards the Conſciouſneſs of Good or Evil, an Idiot may be compared to a Priſoner of War, who, by being confined, is out of Harm's-way; that is, if he, from ſuch Defects, and Diſadvantages, can be of no Service in the Oeconomy of the World, yet he can neither deſign nor commit any Evil, and conſequently can do nothing contrary to the Divine animating Principle, confined and clogged within him; altho' he cannot act in Conformity to the Benevolence peculiar to the Divinity of his animating Principle. Let us add to theſe Reflections ſomething of the State of Perſons depriv'd of Underſtanding by Diſeaſes: The Man whoſe Blood is hot with a violent Fever, whoſe Solids are grown rigid by its Aridity, or any other Cauſe; whoſe

Head is over-loaden with Blood and Humours; has his Senſes and Intellects impair'd, and his Comprehenſion of Objects intirely depraved; or he who, having lived to a certain Age, more or leſs, enjoying a tolerable Uſe of his Senſes and Reaſon till now, is found to dwindle * into Madneſs or Folly, which is by De-

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* Quere! What is the Caſe of a Man, who was endowed with a great Share of Reaſon till he was Fifty; but, in the mean Time having Power, diſtreſs'd and wrong'd a vaſt Number of his Neighbours; and was in the Midſt of his Cruelty and Tyranny deprived of his Memory, Speech, and Limbs; and lived ſome Years in that State? It is eaſy to ſay, what would be the Caſe of a Man ſo ſeiz'd in the Midſt of Acts of Humanity, Juſtice, Mercy, and Truth; we might very boldly pronounce him in a happy State; and, indeed, this Solution points out in a great Meaſure a natural Anſwer to the other Quere. This accidental morbid Loſs of Memory was ſoon reſtor'd, when his morbid Organization was laid down; and he, no doubt, ſoon became conſcious of his paſt Crimes, which became his conſtant Companions, altho' he had forgot them ſo long before.

great very diſcoverable in him; are they not ſo depraved by the Accidents happening to peculiar Parts of the Organization by their Diſeaſes, or by an accidental [illegible] Growth of ſome of their Parts, or by Violence and Injuries of whatſoever Kind? And yet the animating Principle can ſuffer no Alteration in itſelf, and it is only hinder'd from its Functions by the Defect of its inſtrumental Parts, whether from Diſeaſes, Violence, or inſufficient Age.

Now, ſince the more perfectly the Organization is unfolded and looſed, the more this Divine animating Principle in Mankind renders him perfect, as to his Perception of Objects; would it not be yet more refined and perfect in Knowledge, and at greater Liberty to arrive at its utmoſt Perfection of the Knowledge of Goodneſs and Truth, if the Organization were ſhaken off, and the interrupting Load laid down? And would it not be very abſurd to think that Divine animating Principle in any wiſe at its due Perfection here? If the great CREATOR has given us an animating Principle incapable of being injured or divided, tho' the Organization be cut in Pieces, which is undeniably proved before; ſurely it could not be granted for ſo inſignificant and ſhort a Duration, as only till the Organization dies or periſhes here. If the benevolent God has given us a Free-will in this Life, this Free-will would indeed be of no Conquence at all, if it were to have no Concern with a future State; becauſe of the Shortneſs of the Duration of even the longeſt Liver among us; and alſo, becauſe a meer Inſtinct, without ſo large a Scope of Knowledge, Will, or Reflection, would be ſufficient to conduct Mankind thro' a Courſe of Eating, Drinking, Sleeping, *&c.* if the Author of Providence had not laid a Scheme for more noble Purpoſes, both here and hereafter, in the animating Principles of the human Race. Can it be ſuggeſted that Beings capable of the moſt refin'd Contemplations * on the Works of the Creation; Beings

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* What but Contempt and Scorn ought to be the Portion of thoſe whoſe narrow Ways of thinking can make them believe, "That

Obſervations on the Analogy between the Beings capable of being moved and affected, even to an inexpreſſible Degree of Pleaſure, by the combin'd Harmonies of Sound; Beings capable of increaſing and advancing

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“ That all the natural Powers and acquir'd
“ Habits of Mind, that penetrating Judgment,
“ that Strength of Memory and Readineſs
“ of Wit, that Liberality and Juſtice,
“ and Prudence and Magnanimity; that
“ Charity and Beneficence to Mankind, that
“ ingenuous Fear and awful Love of God,
“ that comprehenſive Knowledge of Hiſtories
“ and Languages of ſo many Nations, that
“ experienced Inſight into the Works and
“ Wonders of Nature; that rich Vein of
“ Poetry, and inexhauſted Fountain of Eloquence;
“ thoſe lofty Flights of Thought,
“ and almoſt intuitive Perception of abſtruſe
“ Notions; thoſe exalted Diſcoveries of Mathematical
“ Theorems and Divine Contemplations;
“ all theſe admirable Endowments
“ and Capacities of human Nature, which
“ we ſometimes ſee actually exiſtent in one
“ and the ſame Perſon; can proceed from the
“ blind, ſhuffling, and caſual Claſhing of
“ *Atoms*? I could as eaſily take up with that
“ ſenſeleſs Aſſertion of *Stoics*, that Virtues, and
“ Vices,

advancing their Knowledge and Speculations in all Things, even to their laſt Moments; Beings capable of conceiving Notions which no Part of their Organizations can poſſibly convey to their Underſtanding, and in which no inſtrumental Influence can have any Share; Beings which, when they are acquainted with the Phænomena of Objects by the Help of Inſtruments of their own Invention, are not yet ſatisfied, but have a longing Deſire to look yet further into the hidden Receſſes of Nature, and are fond ſtill of climbing from Effects to Cauſes, and from Cauſes to Cauſes, till loſt in Labyrinths of Thought, myſterious only from the Checks of the interrupting organized Incumbrance, which hinders the Divine animating Principle from ſeeing clearly beyond all we can ſuppoſe; I ſay, can it be imagined, that ſuch Be-

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" Vices, and Sciences, and Arts, and Fancies, " and Paſſions, and Appetites, are all of them " real Bodies and diſtinct Animals: As with " this of the Atheiſt, that they can all be " derived from the Power of meer Bodies.

ing ſhould be depriv'd of all Exiſtence in the Midſt of theſe growing Speculations, which can have no Origin, but what is truly Divine, and which is ſomething beyond the Reach of meer Organization? This is a Queſtion the moſt debaſed, the moſt perverſe Enemy to Truth cannot withſtand; a Queſtion which cannot be anſwer'd, but on the Side of Truth itſelf.

Where then muſt its *Fulneſs of Perfection* be, but in an Hereafter? * And that

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* The Divine *Addiſon* was happy in his Notion of Eternity, which we muſt do him the Juſtice to quote in this Place; ſee the firſt Scene of the laſt Act of his *Cato*;

—— *Whence this pleaſing Hope, this fond Deſire,*
This longing after Immortality?
Or whence this ſecret Dread, and inward Horror,
Of falling into Nought? Why ſhrinks the Soul
Back on herſelf, and ſtartles at Deſtruction?
'Tis the Divinity that ſtirs within us;
'Tis Heaven itſelf that points out an *Hereafter*,
And intimates Eternity to Man.
Eternity! Thou pleaſing dreadful Thought!
Through

that this Hereafter muſt be eternal, will be undeniably evinced from this ſingle Con-

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Through what Variety of untry'd Being,
Through what new Scenes and Changes muſt we paſs?
The wide, th' unbounded Proſpect lies before me,
But Shadows, Clouds, and Darkneſs, reſt upon it.

Our very Imagination reaches Eternity, in ſpight of all the moſt obſtinate Atomiſt can deviſe, or our own contumacious Doubts can influence; may I not as eaſily conceive a Duration of Time beyond that of my own and the Organizations of others, which I daily ſee; nay, even after the Diſſolution of our World, a Continuation of that Duration even to Infinity itſelf; as imagine *that great Truth*, that Space and Worlds exiſt beyond every Conſtellation and fixed Star, the moſt accurate Obſerver has ever diſcover'd, and that ſtill on, without End from Star to Star? As to the pleaſing *Hope*, this happy Author mentions, and the *Longing* after Immortality, it is kept up by Afflictions we ſuffer here, even tho' there were no Poſſibility of Redreſs here for Wrongs receiv'd. Hope is a conſtant Inſtinct, which dictates to Men to look after ſome better State, and is a ſure Preſage

Conſideration: That if the animating Principle be of Divine Origin, if it be in any wiſe related to the Divine Goodneſs and Truth of its Parent, the ALMIGHTY CREATOR; it can never ceaſe to be; theſe are Principles that muſt eternally exiſt ſomewhere; no, it is only *Falſhood* and *Evil*, that can have an End, Principles which cannot be compatible with the Divine animating Principle in Mankind, and which are only Derivatives of the depraved and abuſed Appetites and Senſations inherent in his Organization, which, from too great an Indulgence and Conceſſion of the animating Principle, to thoſe Senſations, cauſe the Paſſions to be always predominant, and ſo, according to their Diſtinctions, produce the whole Tribe of Enemies to Truth and Juſtice. All which Evils muſt ceaſe with the Organizations, which are the Har-

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Preſage in every Man's Breaſt of Futurity. Nor could any Man on Earth be poſſeſs'd of it, if that State were not certain; no more than he would ſhrink at committing a wicked Act, if there was no Power within himſelf that is to live hereafter.

bourers of them; altho' the Conſciouſneſs of them muſt abſolutely remain with the animating Principle.

Hence it neceſſarily follows, that it is required of us, that the animating Principle in us ſhould be the Guider and Conductor of the Organization; that, as the animating Principle is the intelligent rational Part of us, the Uſe of the Organization ſhould be a reaſonable Uſe only; that the ſocial Ends, for which Man was created, ſhould be fulfilled, and not perverted; and as the Judgment, one of the Faculties of the animating Principle, is, on the firſt Impulſe, ever in the Right, theſe Inſtruments of the Paſſions ought not to be actuated but in Conformity to that firſt Impulſe of the animating Principle, the Judgment. It is in this, as in the Caſe of a mechanical Machine, which may be ſet in Motion, and go on without any Rectitude at all; and therefore muſt be ſubject to Regulation and Reſtriction, or the Ends for which it was made are not anſwer'd. Such is the regulating Power in the animating Principle, which muſt render every Action of its Organization compatible with ſocial Harmony, and muſt prevent its Interruption; that muſt correct the Movement of all its Springs; that muſt make the Diſtinction betwixt the Uſe and Abuſe of Things; and, in a Word, that muſt propagate Virtue and Truth, inſtead of Vice and Confuſion, by its Guidance of the Organization.

Another ſtrong Proof of the Immortality of the animating Principle flows from the infallible Juſtice of the GOD of Providence; but if, it were not immortal and ever conſcious * of Good and Evil done

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* If there was no Need of a Conſciouſneſs in Mankind, to *approve* or *condemn* the Mind, with Reſpect to paſt Actions; there was then no Need of *Memory* at all, except for the common Buſineſs of Life, let never ſo many good or evil Actions intervene: But we find it very true, that *neither* can be forgotten; and, indeed, it ſeems one of the moſt benign and juſt Syſtems the ALMIGHTY has granted to us Mortals; what is more kind than to make us capable of feeling the bliſsful Satisfaction which is the Reſult of having done *well?*

done in this Life, that Goodneſs and Juſtice would be liable to be call'd in Queſtion; this is what has been the greateſt Shock to ſome Philoſophers, and at the ſame Time one of the greateſt Conſiderations to prove a future State, when once enter'd upon with Deliberation. Can we heſitate to believe an Immortality of every human animating Principle, when we ſee how the greateſt Villains live and proſper in an Affluence of Fortune, carrying it with a high Hand againſt their Neighbours, diſtreſſing all in their Power, enjoying and rioting in the Subſtance of Widows and Orphans, and, at laſt, going to the Grave unpuniſhed; whilſt

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well? And what more juſt, than his having made us ſuſceptible of thoſe horrible Uneaſineſſes, which ever ſucceed *Baſeneſs* and *Villainy*, even here in this Life? Sure, as this is really ſo, it would be fooliſh and weak to imagine ſo wiſe an Inſtitution, for regulating our Actions, ſhould go no further than the Grave. Whilſt, as we have hinted elſewhere, many *Cruelties*, *Murders*, *Slanders*, &c. remain unaccounted for, and unredreſſed here.

the Innocent * and Virtuous ſuffer a Series of Afflictions and Injuries, by Means of theſe

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* The Hope which fills and occupies the virtuous Mind under Sorrows and Vexations, and the Fear which poſſeſſes the guilty Conſcience, of living hereafter; the former, to enjoy the ſweet Reward of his Goodneſs and Patience; the latter, leſt he ſhould, in endeavouring to ſhake off the Pangs of his Guilt, ruſh upon an Eternity of Puniſhments for his paſt Villanies; are the great Cauſe of hindering Men's voluntary ſudden Exit out of Life by their own Hands, and this Hope and Dread are ſtanding Proofs of an Hereafter. The immortal *Shakeſpear*, in that inimitable Speech of *Hamlet*, draws this Picture in the higheſt Colours:

To ſleep, perchance to dream: ay, there's the Rub;
For in that Sleep of Death what Dreams may come,
When we have ſhuffled off this mortal Coil,
Muſt give us Pauſe; there's the Reſpect
That makes Calamity of ſo long Life;
For who would bear the Whips and Scorns of Time,
Th' Oppreſſor's Wrong, the proud Man's Contumely,
The Pangs of deſpis'd Love, the Law's Delay,
The Inſolence of Office, and the Spurns

theſe powerful Tyrants all their Lives, and at length lie down in the Duſt wrong'd and unredreſſed in this Life. If then there be not an Hereafter for the animating Principle, and if it be not conſcious of paſt Good and Evil, where is the Juſtice? Where is the Goodneſs? Where is the Mercy? Where is the Benevolence in giving Being to Mankind, for no other End but to ſuffer Pain and Miſery at the Hands of one another? And what but Partiality, which is Injuſtice itſelf, could have order'd Sufferings like theſe for ſome, and a Power of tyrannizing to others, for the ſhort Date of the Life of Man here, were there no Puniſhment for the Unjuſt and Baſe, no Happineſs for the Virtuous and Injured, in an

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That patient Merit of the Unworthy takes,
When as himſelf might his Quietus make
With a bare Bodkin? Who would Fardels bear,
To groan and ſweat under a weary Life?
But that the Dread of ſomething after Death,
Th' undiſcover'd Country, from whoſe Bourn
No Traveller returns, puzzles the Will,
And makes us rather bear thoſe Ills we have,
Than fly to others that we know not of.

Hereafter? This is a Conſideration dreadful in its very Eſſence, if *Juſtice* was no where to exiſt.

But who can behold the Beauties of all the Parts of the Creation? Who can ſee himſelf, and know he exiſts? And at the ſame Time behold not only the careful Proviſions made for him, but alſo the numberleſs proviſionary Methods of propagating and preſerving them for his Uſe, without knowing at the ſame Time, that they were thus created for him, as well as for the Tyrant, that cauſes him to want them; as well as for the Avaricious, who abuſes the good Things of Life, in denying them not only to others, but even to himſelf; as well as the Slanderer, who robs the Virtuous and Innocent of the Means of honeſtly acquiring a reaſonable Share of the general Maſs of Proviſions, generouſly allow'd to all by the great and wiſe Diſpoſer of all Things? I ſay, who can be ſenſible of theſe Things, who obſerve this divine Impartiality, and doubt of future Rewards for the Virtuous, and future Puniſhments for the Evil-doers? For

Millions of evil Deeds are unpuniſh'd, Millions of Wrongs done without Reſtitution, in this Life; and therefore, ſurely, tho' a wicked Perſon may eſcape Puniſhments here, it is impoſſible he ſhould ever ſhun the Juſtice of that Divine Law, which neceſſarily points out, that ſocial Virtues and Benevolence ſhould be the reciprocal Commerce between Man and Man, during his ſhort Stay here, and that under ſevere Reſtrictions and Penalties annexed to them; where then muſt this unerring, certain Juſtice take Place? If not here, muſt it not be ſomewhere elſe?

Hence one is naturally led to think, that when our animating Principle is clear'd of its Load, and in an Hereafter, and conſequently in its utmoſt Degree of Perfection, as to Perception and Knowledge, its Conſciouſneſs of having imitated the Divine Creator in Goodneſs here, as well as poſſible, muſt carry along with it a Qualification and Claim to the high State of Bliſs, that is, from the very Nature of God, certainly ready for it, becauſe it is in a certain Degree render'd ſimilar to its CREATOR thereby. But what muſt be the Caſe of the Conſciouſneſs of the animating Principle, which has conceded to gratify the Paſſions of *Pride*, *Envy*, and *Malice* here, in the moſt oppreſſive Manner, committing Outrages of every Kind, when it was at the ſame Time ſenſible of running counter to the Divine Example of benevolence itſelf had plentifully ſhared, where the ſocial Neceſſities I have mention'd dictated otherwiſe, and yet were of no Force in conducting the Acts of its Organization? Muſt it not be miſerable in the perpetual and ever remaining Remembrance of the Wrongs and Tyranny committed here unattoned for, and now never to be atoned for? Can it lay any Claim to the Mercy of its great Maker, can it accompany its heavenly Father, whoſe Goodneſs and Truth it has degraded, whoſe Juſtice it has perverted and corrupted, whoſe Divinity it has ſully'd? We may eaſily comprehend what will be its Condition, by comparing it with the dreadful Reluctance and Horror of Mind, to be every Day found among Miſcreants even in this Life, after having committed any black Crime; they are reſtleſs, have loſt all Comfort, are tired of Life, and would give the Univerſe to change ſo helliſh a State, in the Midſt of Heaps of Riches, for that of the innocent Beggar in the Midſt of Rags and Vermin, when they reflect upon what they have done, irrecoverably done, and never to be repair'd.

This naturally leads us to underſtand that, altho' Man has a free Will to chuſe Good or Evil, yet, that he is under certain Reſtrictions, and ſubject to certain Conditions, which are only what conduce in the End to his own Welfare; and theſe Conditions imply his being abſolutely created for good Ends and Purpoſes; and, to illuſtrate this, we need only to conſider the Goodneſs of God, in laying this beneficial Obligation upon us, I mean that of chuſing the Good; for it is apparent and undeniable, that to do Good is much more eaſy in itſelf than to perpetrate Evil; for the Principle of Good is ſimple and eaſy, and always carries with it a pleaſing Satisfaction, which is Reward enough in itſelf, for having done well; but that of Evil is complex and uneaſy, and is always accompanied with tormenting Struggles and Self-condemnation; this is a Bleſſing not ſo much attended to as it ought to be, altho' the Goodneſs of God and his Love to Mankind can never appear more glaring and manifeſt in any other Circumſtance than in this before us: That, ſince he was pleaſed to make Man thus a free Agent, the Inclination to chuſe the Good and avoid the Evil ſhould be attended on the one Hand with theſe invitatory Circumſtances, and on the other with ſuch as are naturally ungrateful and forbidding. And moreover, that the Imitation of his Beneficence to us, ſhould be the daily Practice of us to one another *; for as he has been

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* Mankind has an amazing Biaſs and Sympathy of Mind to his Fellow-creature, and this ſeems to be one of the greateſt Ornaments that can attend the Mind, in thoſe where Pride and Arrogance has not got the Dominion over them. It is every Day obſervable in Numbers of Men, and is one of the greateſt Demonſtrations of the ſocial

been graciouſly pleaſed to give us Being, and with it all poſſible Neceſſaries that can render us as happy as our tranſient State in this Life can thus admit of; ſo he likewiſe requires we ſhould contribute Happineſs to each other; and he that is a Tyrant to his Fellow-creatures, runs counter to that great Example of Mercy, and conſequently to Juſtice and Truth, the very Eſſence of the Conditions of his Exiſtence and free Will here; for it can by no Means be agreed to, that his free Will was given him, for vile Purpoſes by the God of Juſtice, Mercy, and Truth.

ſocial Duties of one to another, elſe why does one Man ſhrink at ſeeing another fall? What Occaſions the Alarm and Shock at ſeeing Danger attend another, even at a great Diſtance, when nothing can hurt us? Why do we feel Pain with others, and why are we influenced to Mirth or Sorrow at ſeeing others rejoice or weep? Is it not from that Divine Principle within us, which is ready to prompt us to give to others the kind Aſſiſtance we ſhould, at another Time, be glad of ourſelves?

Thoſe who alledge that the Troubles, and Vexations, and bodily Pain ſuffer'd in this Life, are ſufficient Puniſhments for any Evils that can be committed in the Body, are involv'd in a dangerous Error, which the following Diſtinction will very clearly prove: If the Nature of Good deſign'd to ourſelves be to preſerve ourſelves to the beſt of our Power, that Preſervation is chiefly carry'd on by the *moderate* and *natural* Uſe of the Food and other Neceſſaries allow'd us by Providence, and which are generally procured us by honeſt Induſtry; but, as to the *Evils* ariſing to our Organizations, from *Exceſſes* and *Abuſes* of thoſe Things which are allow'd us here, for our Conſervation and Comfort, the Miſeries and Sufferings that are the Conſequences of ſuch Abuſes, may be, perhaps, in the Opinion of ſome, a ſufficient Puniſhment for them only *; but it is the animating Principle, which ſuffers hereafter for Abuſes offered others; that

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* I am apt to believe, however, that beſides the Duties we owe to God, and to our Neighbours, there is yet a Duty we owe ourſelves; and it ſeems to me a neceſſary Conſequence

ſequence of the Law of Self-preſervation. If our Preſervation can beſt be carried on by the moderate Uſe of the Proviſions ſent us by his Providence, ſurely to hazard our Safety and endanger our Lives by the Exceſſes of Eating and Drinking muſt be criminal. Life is a Talent beſtow'd on us to huſband and preſerve to the beſt of our Power, and we are anſwerable for it to him that gave it. We claim by Right a Sufficiency of Meat and Drink, in order to fulfil that End, but can have no Right to an Exceſs, which may deſtroy us. But there is another Conſideration which makes it not only criminal in the Eyes of our Creator and Supporter, but diſgraces us in the Eyes of one another; Drunkenneſs and Gluttony are ungrateful Abuſes of the good Things of Life, and pollute our Bodies, turning them into Veſſels of Uncleanneſs, which God has commanded us to keep pure and undefiled; Vices ſo low, that the Brutes themſelves never ſink into them, but are content with enough; Vices which ſully the Mind, that ought to be kept clear; bring Beggary to Families, and ſcandalize the ſober Part of Mankind.

is, in being conſcious of having been an Enemy to Moral Society, and of having injured and diſtreſſed Fellow-creatures, inſtead of having been benevolent, aſſiſtant, and kind; for Moderation and Temperance, in the Uſe of the Neceſſaries we want, brings with it Health and Enjoyment, and the contrary ſurely introduces Diſeaſes and Pain; ſo likewiſe Troubles, ariſing from our own Giddineſs and Miſconduct in other Matters, terminate perhaps with their Puniſhment here; as if, in the very common Neceſſaries of Life, the Author of Providence had pointed out to us a Means of Happineſs here in our Organizations, in the proper and moderate Uſe of thoſe very Things, which muſt inevitably prove our temporal Puniſhment, if they are abuſed.

And if the libertine Part of the World ſhould imagine, that they were made to be free, in any Manner of Behaviour amongſt their Fellow-creatures, which ſeems beſt to them, let them know they are miſtaken; and from what has been ſaid it is clear, they are ſubject to certain Reſtrictions and Conditions, as was in ſome Meaſure before obſerv'd; becauſe the great CREATOR who gave them Being, knew the Frailties to which the Imperfections of their State here would render them liable, and therefore annexed to them intrinſically the very Laws or Rules to direct their ſocial Conduct; and indeed, if the great CREATOR has order'd all the Animal and Vegetable Parts of the World to be propagated and governed under the conſtant Reſtrictions of ſuch Phyſical Laws as I have juſt explain'd; if the heavenly Bodies are alſo ſubject to their unalterable Motions, to which they are daily obſerved to be conſtant; and in a Word, if the whole Oeconomy of the Univerſe be limited to thoſe Phyſical Laws alone, which are conducive to its Preſervation and Government; can it be preſumed that Man, who is but one ſmall Part of the Whole, ſhould be exempt from Laws and Reſtrictions ſuitable to his Nature? And, as his Organization is truly governed by certain Phyſical Laws, can it be ſaid his animating Principle ſhall not be reſtrain'd by, and ſubject to Moral Laws? No ſurely, for this plain ſimple Reaſon, that that Goodneſs and Truth, which are the firſt innate Faculties of the animating Principle might be preſerved as much as poſſible from Violation; for the Almighty beſt knew what kind of Government to ſubject us to, and what was beſt ſuited to our Natures; and was ſo merciful and good to Mankind, as to ordain that the firſt Impulſe of the Judgment of the animating Principle ſhould be always right, however *alter'd* afterwards by the Perverſeneſs of our own Will.

We muſt not neglect making uſe of this Opportunity, to reflect a little upon the State of the preſent Notions concerning theſe Things, in ſeveral Parts of *Europe*, where one would imagine they ought to have the pureſt Ideas of the Government of the Univerſe, as created and ſupported by one only God of infinite Power.

The *Pythagorean* ſeems to have ſwallow'd up the *Platonic* Doctrine, and but too much prevails at this Time; the former comprehended one *univerſal Spirit*, animating or moving the Whole of

Nature, as well the heavenly Bodies, as all Animals and Vegetables whatſoever; and this was call'd *Anima vitalis*, * or *ſeminaria Virtus*, and was by that Philoſopher and his Followers eſteem'd to be the only Deity, whereas *Plato* accounted it but the *Work* or *Effect* of one SUPREME GOD, to whom be referred, as the CAUSE of all. *Virgil* in his ſixth *Æneis*, at the Interview between *Æneas* and his *Father*, makes him gratify his Son's Admiration and Surpriſe at the Things he ſaw in *Elyſium* with the following Account; whoſe Words I chuſe to ſet down here, as he ſeems to expreſs *Virgil*'s own Notions of the Matter, who in another Part of his Works ſeems a little to favour the Doctrine of *Epicurus* †, and blends it together with

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[*] See theſe Opinions canvaſs'd in the firſt Chapter, where we animadvert upon *More* and other Authors on the *Plaſtic* Power, *Soul* of the World, *Spirit of Nature*, &c.

[†] See his ſixth *Eclogue*, 31ſt Line; and again throws in Sentiments like theſe in his *Georgic* IV. Line 220.

Souls of the two Philoſophers mention'd, of which this ſeems to be the Sum:

Principio cœlum, ac terras, campoſque liquentes,
Lucentemque globum Lunæ, Titaniaque aſtra
Spiritus intus alit, totamque infuſa per artus
Mens agitat molem, et magno ſe corpore miſcet.
Inde hominum pecudumque genus, vitæque volantum,
Et quæ marmoreo fert monſtra ſub æquore pontus.
Igneus eſt ollis vigor, et cœleſtis origo
Seminibus:——

In this Light theſe Doctrines were receiv'd in that Poet's Time, and are nearly ſo to this Day by many others, eſpecially in Regions not very remote from thoſe which gave him Birth. But this was afterwards refined into ſeveral Subdiviſions, as it was the Fate of every other religious Syſtem ever produced in the World, from the Proneneſs of Men's Minds to Change and Variety. It was pretended, that immediate Emanations, or, in other Words, Elongations, of that *Spirit* perform'd every Phænomenon in the World; in *Men*, it ſpoke, hoped, fear'd, lov'd, &c. in Animals of different Natures, it bark'd, growl'd, hunted, warbled,*&c.* according as every Thing tended in its Nature, mov'd the heavenly Bodies, and grew and flouriſhed in the Vegetable Kingdom *. And hence a moſt refin'd Concluſion was induſtriouſly drawn, that, as the *ſeminaria virtus* was guided by its own Pleaſure, if it were ſo diſpoſed, it could withdraw that Part of itſelf, that, for Example, vivified a Man or any other Animal to its utter Diſſolution and Annihilation; or might, by ſhrinking univerſally into itſelf, annihilate the Univerſe.

Thus were the wiſe Men of the World endeavouring to *ſteal* themſelves away from any Pretenſions to perſonal *Identity*, and conſequently from any Obligations of being accountable for their own proper Actions, of whatſoever Nature. But alas! Who can fly from the Judgments of his own Mind? Which Judgments could not *poſſibly* exiſt, but for the Sake of perſonal *Identity*; and, if this ſuppoſed Deity may be ſaid to actuate every *Being* ſuſceptible of Paſſions, there is no more Reaſon to ſuppoſe it ſung in the Bird, bray'd in the *Aſs*, ſpoke in the *Orator*, and ſo on; than that it blaſphemed in the *Miſcreant*, robb'd in the *Thief*, murder'd in the *Murderer*, bore falſe Witneſs in the *perjured Villain*, and betray'd with the *Traitor*. Now how does this ſquare with ſome of the Attributes of Benignity they allow'd this very Deity? For no one Act of Mankind could, if this alone were the Caſe, be his own, but he would be in a State of Compulſion all his Life; how cloſely this borders upon the Whims of the Sect of *Fataliſts!* how ſoothing a Doctrine too to the impious *Libertine*, who, in the Midſt of his Rioting, rather than abandon his Courſe, can comfort himſelf, with the *baſe*, *deſperate* Hope of being annihilated, while his own contumacious *Will* belyes his Conſcience in every Act, and threatens him with Deſtruction; or, if he relies on the *Metempſychoſis*, as other *Pythagoreans* do, and is conſcious at the ſame Time of any Guilt (which none can fly from) who can think himſelf happy that the worſt that can befall him, is to be degraded into ſome *inferior* Creature!

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* This ſeems to be the Source of the *vis Plaſtica*, of which I have ſpoken before.

Creature. The great Ornament of the human Race is the glorious Hope of an Eternity of greater Happineſs, and of enjoying a more ſublime and unſullied Knowledge of Things, and of our Maker; which nothing can deprive us of, nor can any Thing reduce us to the Miſery of knowing we deſerve to be degraded, but groveling mean *Impiety* here.

But the Divine Impulſe within Man, that I have been ſpeaking of, ſufficiently aſcertains to him his perſonal Identity; his *Hopes*, *Fears*, and every other Paſſion confirm it; the Neceſſity of reciprocal Sociality and Dependence, and every Act of *Volition* in all Animals, ſeal its abſolute Certainty, as well as proclaim the *Freedom* of our Agency in this Life.

We can alſo be ſenſible of our Identity by many other Obſervations: I can perceive that every Attribute of my *animating Principle* is concerned totally for myſelf, and not for any one elſe. The Memory of all paſt Actions, at all Times, from my Infant Years, is my own; which no one elſe can, at all, appear to be intereſted in, except ſuch By-ſtanders, as are capable of bearing Witneſs for me, that I performed ſuch Things in and for myſelf. My Hope is my own, and for myſelf, of future Advantages; my Fear is my own; and, in ſhort, the firſt Law of Nature ſufficiently proves the perſonal Identity of myſelf in all Reſpects; and that my Hopes ſhall be fulfilled for my own identical Advantage; or fruſtrated to my own identical Loſs, either here or hereafter.

As to the Structure of Bodies, not only of Men and other Animals, but alſo of every Vegetable in the World, it is Matter of no ſmall Surpriſe to me to ſee, that, notwithſtanding the Similarity of Subſtance between each one of the ſame individual *Species*, yet, that no two ſhould be exactly alike. No two Men, no two Horſes, *&c.* are exactly alike; nor, among Trees or Plants, no two, of the very ſame Species, grow exactly in the ſame Lines, tho' their Qualities are perfectly the ſame. What is this, or what can it tend to, but to point out the perſonal Identity of every Being on Earth? Every Thing ſhews it clearly in the ſucceſſive Propagation

tion of Plants and Animals, that each young Animal and Plant was not before a certain Time; that its Parent was identical, before it was produced; and that, after its Production, it was identical too, and properly diſtinguiſhable from every other; and conſequently, that its Parent and itſelf were too diſtinct Beings; each Animal thinking and conceiving differently for itſelf, and being ſucceſſively multiply'd. I was the identical Perſon who was born in ſuch a Year; who went to ſuch a School, and who now am what I am; and know that the Conſciouſneſs, through theſe different paſt Occurrences of my Life, is that of the ſame animating Principle, which is now judging, in me, of preſent Things.

And, if the Characteriſtics of all Things in the World are peculiar to themſelves, we have no Reaſon to doubt the Identity of the animating Principles of Animals, ſince their Attributes daily ſhew them to be peculiarly identical to themſelves. Nor is this Identity confin'd to Animals and Vegetables alone; every Subſtance of the Earth is alſo diſtinguiſhable from every other, by its own proper Characteriſtics; but I will again aſk, what is more convincing than the very Act of Volition in the Mind of every Animal, to ſhew the Identity and Property of its own very Will; and why were Men made capable of ſuppoſing a future State, if it were never to come to paſs?

In cloſing this Treatiſe, we cannot but naturally fall upon the following Concluſion, as a neceſſary Conſequence of what has been all along hitherto advanced; and that is, that ſince we ſee the greater Part of Mankind very prone to chuſe the Evil and forſake the Good; ſince Fraud, Oppreſſion, and Tyranny, the ſad Effects of Pride, reign almoſt uncontroll'd among Men every-where; and ſince it is evident that the *Juſtice* of the ALMIGHTY muſt be fulfilled ſome where or other; it would ſeem to me, beſides the many Advantages mention'd before for Man's Welfare) as if there was, in the *Benevolence* of GOD, a farther Neceſſity for a *Scheme* to ſecure his *Salvation*.

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